SCIENCE GOSSIP.

HARDWICKE'S

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1892.

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Science-Gossip:

AN ILLUSTRATED MEDIUM OF INTERCHANGE AND GOSSIP

FOR STUDENTS AND

LOVERS OF NATURE.

EDITED BY

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PREFACE.

IN writing a few lines by way of Preface to the Annual volume of SCIENCE-GOSSIP, the Editor calls to mind that this is the twenty-eighth yearly presentation to the world of a Magazine founded and edited in the interests of popular Science. The period in question is a long one, even in the life of a man; it is comparatively longer in that of a Magazine. Within its lifetime what hosts of new discoveries have been made; what myriads of original observations have been chronicled! The entire history of Science has no more eventful period. The twenty-eight volumes of our Magazine constitute the best popular encyclopædia of this eventful time. No wonder, therefore, they are constantly in demand among our newer subscribers; and inquired for in publishers' and booksellers' Catalogues, in the "Original blue cloth." SCIENCE-GOSSIP stands alone in the fact that its earlier numbers fetch more than their original price. Even its own publishers offer double for certain numbers, to make up sets; and those from the first to the two hundred and twenty-eighth issues are stated at eightpence instead of fourpence.

Within its literary lifetime, SCIENCE-GOSSIP has had to compete with numerous rivals; but it has succeeded in keeping its place in spite of able and keen competition. We would point out that each annual volume has been marked by distinct scientific features. In the present volume, for example, we would call attention to the able and original papers of Messrs. Lord, B. Thomas, Bryce, Nunning, Harcourt-Bath, P. Thompson, H. Friend, A. Bennett, T. V. Holmes, Tansley,

Griset, T. D. Cockerell, and others, in illustration. All the chief events in Natural Science have been discussed with an open mind. Nothing of importance in this department of modern research and observation has been left out.

Men's lives wear out, and old and zealous contributors die off. New ones take their places, and one of the chief pleasures of the Editor's experience is the geniality displayed by his numerous correspondents. The price of SCIENCE-GOSSIP is not likely to bring its publishers a mine of wealth, but the Editor can testify to their zealous co-operation and sympathy with its aims and work. On this account alone, therefore, he asks the individual aid of every one of its present subscribers to introduce the Magazine they evidently like so well to their friends, so as to ensure a still larger circulation. The hands of both Editor and Publishers would be much strengthened thereby, and the fame of the now familiar old "Gossip" would be spread wider than ever.

Christmas is the season for greetings, and although the apparently official task of writing a few lines of Preface for twenty-two years successively at length approaches the nature of a task, it is not because of the lack of sympathy manifested by readers and contributors. Their name is Legion. Christmas comes but once a year, but it enables the Editor to shake cordial hands, metaphorically, with all his unseen friends, and wish them all a warm

CHRISTMAS GREETING.

LIST OF ILLUSTRATIONS.

THE EXTINCTION OF THE GREAT SEA-SERPENT.

By RICHARD BEYNON, F.R.G.S.

THE nineteenth century is an age of transition. There is little that has escaped signing with the mark of change. Scientific development has invested most things with a modern air of improvement and utility that contrasts violently with the staidness and slow-pacedness so characteristic of the age of our grandfathers. Then people had leisure to be sentimental, now the stern demands of the business of life denominate sentiment unprofitable, and we sigh in vain for the more credulous and less curious days of yore, when the earth yet possessed hidden corners and the ocean unfathomed depths, in which the imagination might roam at will, peopling land and sea with grotesque fancies of curious birds and flowers, strange animals, and still stranger fishes. But all this is changed. Geographical exploration and research have very materially circumscribed the confines of the district where the possibilities of nature were existent, and instead of revelling among the luxuriant idealisms of the might-be, we must perforce content ourselves with the more prosaic knowledge of that which absolutely is. Long after the teachings of travel had dispelled the old illusions

> "Of the cannibals that each other eat,
> The Anthropophagi, and men whose heads
> Do grow beneath their shoulders,"

popular belief still loved to inhabit the recesses of the ocean with monsters, traditions of which had been handed down from the very earliest ages. It is a melancholy fact that such creations do not survive the irresistible advance of modern science. The blast of the steam-whistle seems fatal to romance, and the endless procession of steamships that join in the bonds of commerce the nations whom the seas divide, will soon tend to reduce ocean voyaging to the practical level of a railway journey. But there is one belief deep-rooted in the nautical mind, and equally accepted by landsmen, that probably will never be effectively eradicated. The great sea-serpent always has and always will be a denizen of the ocean. Why should not the mighty sea produce a creation worthy of itself? "The wisest palæontologists deny its existence," say the sceptics. They are able to find no definite data upon which to assign the monster a place in the ranks of animated nature. "Never mind positive proof," argue the believing ones, "prove conclusively that the creature does *not* exist, and then, and not till then, will we give up our faith in its being." And so it has come to pass that the sea-serpent lives on, and will continue to do so until its existence is disproved—a task admittedly impossible.

The widespread belief in the existence of some great ocean monster has been common among all maritime nations from the very first ages, and the prevalent faith in the great sea-serpent is no doubt traceable to the myths of our Aryan ancestors. It is worthy of note that the popular notion of the sea-serpent is decidedly Miltonic. In "Paradise Lost" the description of the arch-fiend is the exact prototype of the sea-serpent as seen by captains of merchantmen and others.

> "With head uplift above the wave, and eyes
> That sparkling blazed; his other parts besides
> Prone on the flood, extended long and large,
> Lay floating many a rood, in bulk as huge
> As whom the fables name of monstrous size."

The Kraken, so minutely described by Pontoppidan, the good Bishop of Bergen, goes on all fours with the account of the serpent alluded to

above. The sea-serpent of his day was seen to rise from the sea in undulations, the visible portions looking like islands covered with seaweed, while it waved in the air mast-like arms, capable of dragging ships beneath the waves; its sudden sinking caused a whirlpool credited with the power of engulfing the stoutest vessels. It is unjust to the memory of the good and pious Pontoppidan to think that such a keen observer of nature is exaggerating, but in all probability the Kraken was one of the gigantic cephalopods which occasionally make their appearance off the Norwegian shore. The Atlantic Ocean is, however, *par excellence* the home of the sea-serpent. This is not as might be expected, for it is a well-known fact that certain parts of the Indian Ocean, especially those adjacent to India and the East Indian Archipelago, swarm with veritable sea-serpents, members of the genus Hydrophis or Hydrus. These creatures, which resemble eels, being keeled on their under sides, are but from two to five feet in length; and it is no doubt owing to their smallness of size, and the fact that they occur near land and in considerable numbers, that they have never been magnified into real "great sea-serpents."

In mentioning a few of the best authenticated instances of the sea-serpent placing itself in evidence, it must be remembered that the monster appeared most frequently when the ocean was much less traversed than it is at present, when wind-power reigned supreme, and the size of merchant-vessels was far below their present dimensions. Many a ship-master then had the tedium of a long sea voyage agreeably enlivened by a cursory view of the great leviathan whose existence his sympathies and training forbade him to doubt.

In 1818 we have the solemnly-attested evidence of the master and one of the crew of the American schooner *Adamant* that they saw a gigantic sea-serpent not far from the Atlantic littoral of the States. At first it was guessed to be a half-submerged wreck, but this illusion was dispelled by the creature uncoiling itself and rearing its head above the waves. The description of this monster is graphic and very detailed. Its colour was black, and its length 130 feet, while its neck was upwards of six feet in diameter. Bullets rebounded from its scaly encasement; and for upwards of five hours it was on view to the schooner's crew.

The Atlantic sea-board of the United States would seem to be the favourite haunt of the sea-serpent, for in June, 1815, and in August, 1817, he is said to have been frequently seen disporting himself off Gloucester, some thirty miles from Boston. This specimen appears to have been of the Pontoppidan type, for he looked like a number of buoys placed in a line. His length was variously estimated from 90 feet to 250 yards, a rather marked difference between the two limits. Once again, in 1819, he was seen off Nahant, also in close proximity to Boston, this time making curves perpendicular to the plane of the water. He paid yet another visit to this locality, being seen in almost the same spot in the summer of 1833. The latitude of Boston is $42\frac{1}{2}°$ N., yet this does not mark the northern limit of the sea-serpent's peregrinations. In June, 1834, he was encountered by the ship *Robertson*, of Greenock, in 47° N., 59° W. On this occasion he moved through the waters at a speed of nine miles an hour, keeping up with the vessel and exposing his head and shoulders, which were covered with a thick fluted skin of a green colour. In 1835 the great serpent was encountered twice, each time by vessels voyaging between Boston and New Orleans. He is next seen by Captain Blyl, of the barque *Hendrix*, this time south of the line, in 27° S., 15° E. They sailed in company for nine days, when it dropped astern and finally disappeared below the horizon. There is something very peculiar in the behaviour of this specimen, for he allowed upwards of one hundred bullets to penetrate his skin and tinge the sea with blood, without it occurring to him that he could escape from his foes either by submerging himself in the water, or putting a greater distance between himself and his tormentors. For nine days he withstood their annoyance, and then was left behind by the vessel increasing its pace.

Perhaps the most important case on record of the appearance of a sea-serpent is that reported by the officers and crew of H.M. Frigate *Dædalus* in 1848. The vessel was 24° 44′ S. and 9° 20′ E., in the South Atlantic Ocean not far from the coast of Africa, when, according to the account forwarded by the captain to the Admiralty, a huge monster was encountered swimming rapidly; "an enormous serpent with head and shoulders kept about four feet constantly above the surface of the sea. The diameter of the serpent was about fifteen or sixteen inches behind the head, which was without any doubt that of a snake, and it was never during the twenty minutes that it continued under the view of our glasses once below the surface of the water. Its colour was a dark brown with yellowish white about the throat. It had no fins but something like the mane of a horse, or rather a bunch of sea-weed washed about its back." It is a matter of great pity that the exact position of this particular specimen in the scale of nature was not ascertained. It approached as near as 100 yards to the vessel, and the gunnery staff of the *Dædalus* must have made very indifferent practice could they not have struck so large a target as the monster presented to them. Drawings of this sea-serpent appeared in the "Illustrated London News," and a controversy was provoked relative to the existence or non-existence of great sea-serpents, which caused much ill-feeling and which took long to subside. One theory suggested that to account for the animal seen by the *Dædalus* it was only necessary to suppose it was some

member of the seal or walrus family. It is a well-known fact that such creatures are often found afloat on fragments of ice which are detached from the parent ice-field. These detached portions travel from the pole, equatorwards, and melting away as they pass into warmer latitudes, deposit their living freight in the ocean, where they must swim for dear life to the nearest land to procure rest and food. If the sea monster under discussion were of this class, he was apparently fated to meet with a watery grave, for in the words of the report: "It did not either in approaching the ship or after it had passed our wake deviate in the slightest degree from its course to the south-west, which it held on at the pace of from twelve to fifteen miles an hour, apparently on some determined purpose."

It is rather a coincidence that some six weeks later the *Daphne*, an American brigantine, reported passing in 4° S., 10° E. a gigantic creature of the snake family. It appeared about 100 feet in length and had the stereotyped appearance of the serpent or snake with a dragon's head. From the locality where the *Dædalus* monster was observed to where the crew of the *Daphne* descried theirs is, roughly speaking, some 1,500 miles; and assuming, as has been suggested, that the animal was one and the same creature, then it must have followed pretty closely the trend of the African littoral. Assuming this supposition to be feasible, it is rather peculiar to note the nomenclature of the more salient features of the coast along which the creature would pass.

Great Fish Bay, Little Fish Bay, Walvisch (Whale-fish) Bay, Nourse River and Whale Head, all show that great fish and seal-like animals abound off the coast, so that it is quite within the bounds of possibility that the "sea-serpent" was some huge fish whose visible parts presented the appearance ascribed to the "great sea-serpent."

Some nine years subsequent to this, the crew and officers of the ship *Castilian* were entertained with the sight of some ocean monster when navigating close to the island of St. Helena. Some ten or twelve feet of the creature's head were visible above the waves, and the total length of the "serpent" was variously estimated at from 200 to 450 feet. It seems strange that there should be such disparity in the estimates of the creature's length, for the monster lay extended on the ocean and the distance of the vessel was but thirty yards.

Navigators of the present day think twice before reporting the seeing of a "sea-serpent." Superstition and with it the belief in the "great sea-serpent" are fast being banished from the British Mercantile Marine, and a master who reports seeing anything of the kind is certain to bring down upon his head a torrent of ridicule. But the monster is not yet defunct. America, which in the opinion of a section of its inhabitants enjoys a monopoly of all that is great and marvellous in nature, has still some three or four of these gigantic snakes cruising in their waters, and each season they considerately raise their heads above the surface of the sea in the neighbourhood of some fashionable watering-place, and the imagination of the visitors and the press fill in the details with a graphic minuteness of detail that leaves nothing to be desired. To the remainder of the world the "sea-serpent" is almost extinct. It has died out like the dodo, and even its prior existence is now regarded as extremely mythical. But in 1890 at such a well-crossed spot as 42° N., 29° W., a sea-serpent presented itself to the astounded gaze of the master and crew of the *Thomas Hilyard*. It is matter for regret that this monster of the deep did not choose to reveal itself to some Atlantic liner, for then, among the many eyes that would have gazed upon it, some might be relied upon to observe the creature with a quiet and scientific scrutiny and to convey to the rest of mankind a true picture of the creature, founded upon what really is and not upon preconceived notions of the appearance an orthodox sea-serpent should present. From a few words of alternative description in the account of the monster encountered by the *Thomas Hilyard* we may draw our own conclusions as to the decadence of popular belief in the existence of the great sea-serpent. The creature is not represented as being a sea-serpent and "nothing more," it is a sea-serpent *or* a gigantic fish of the conger-eel species. There is much virtue in the "or," and the hardy skipper of the *Thomas Hilyard* has placed on record a pretty accurate estimate of the state of nautical opinion regarding the sea-serpent.

Yet one more manifestation, this time off the coast of North Island, N.Z. The account given of the monster, as seen by the chief officer of the *Rotomahana*, is singularly lucid and circumstantial. It runs as follows:—

"On the morning of the 1st of August (1891), about 6.30 o'clock, we were off Portland Light, between Gisborne and Napier. I was on deck, looking over the weather-side for land, when I saw the object, whatever it was, rise out of the water to the height of thirty feet. Its shape was like a huge conger-eel, with the exception of two fins about ten feet long. The creature was not more than 100 yards away, and I estimated its girth at between ten and twelve feet. It was broad daylight at the time, and the sun was shining brightly!"

This statement is substantially corroborated by the quarter-master of the same vessel, who saw the creature first and drew the chief officer's attention to it. If further evidence were wanting that a sea monster of some kind or other has placed itself on evidence in New Zealand waters, it is to be found in the parallel testimony of a surveyor resident at Gisborne, who wrote to the New Zealand papers that while on another of the Union Company's steamers, the *Manapouri*, on July 24th, he and several others

saw a sea-serpent resembling the one seen from the *Rotomahana* off Portland Island. The monster was also seen by the officer in charge of the vessel. It is difficult, indeed, to properly assess the value of this, the latest contribution to sea-serpent lore.

Now the question very naturally occurs to all: What is the exact value attachable to the minute accounts of the sea-serpents reported by actual eye-witnesses? To say that they were sheer fabrications, nautical twisters, invented to feed a popular prejudice, would be to throw a doubt on the character of the seaman for veracity that is most unjust and unreasonable. Yet to admit *in toto* the infallibility of any one of the accounts of the "great sea-serpent" is to accept as a tangible fact the existence of a creature which the major portion of humanity are agreed to regard as purely mythical. Probably those who have helped most largely to feed the at one time widespread belief in the ubiquitous monster of the deep but reported accurately what they thought they saw. Granted that a seaman has a traditional notion of what a sea-serpent should be like, he will mould anything which resembles that appearance to his own ideal and hence no doubt the marked agreement between the leviåthan of poetry and art and Jack's sea-serpent. At sea the most keen-sighted may easily be deceived, and a floating log, festooned with sea-weeds and enveloped ever and anon with the spray that flashes from the ocean swell, would present an appearance quite analogous to a bemaned sea monster:

> "A great serpent of the deep,
> Lifting his horrible head above the waves."

It is but sufficient to premise a belief in the existence of the great sea-serpent and the ever-changing sea-scape of an ocean voyage will present abundance of visible phenomena that may well be read as "sea-serpent." The eye often deceives itself and may often see objectively that which the imagination conjures up and which the mind is quite prepared to encounter. No doubt this tendency has much to do with recorded appearances of the sea-serpent, for it is remarkable that in the majority of cases one observance is generally followed by corroborative appearances.

Despite all this, however, despite the teachings of science, the sea-serpent belief dies hard. The great leviathan that takes his sport in the great waters is one of the sights that they who go down to the sea in ships will continue to see for some time to come yet. But as far as popular belief in the existence of the great sea beast is concerned its knell is already rung and one of the most poetical and grandest conceptions of ocean's inhabitants is fast passing away before the unsympathising realism of the nineteenth century. But even its bitterest opponents must admit that little is gained by the expurgation of the belief from the popular mind. The loss may be an abstract one, but it is a great one notwithstanding, for in the words of "Nature's poet:"

> "But yet I know where'er I go,
> That there hath passed away
> A glory from the earth."

TO THE VINEYARDS AND THE PLAY.

By A. H. Swinton.

OCTOBER, that has embroidered the vineyards of La Vendée with a cloth of gold, has commenced to paint the greenwood with fiery yellow and vermilion; and as it were by magic the rows of aspens which have so long pattered fretfully in the sighs of the west wind, are dropping their amber leaves around our hamlet, where the round copper-coloured gourds are reddening to orange. Besides its glory of situation among tumbling crags and knolls, our loveliest of villages does not appear to satisfy the longing, except the fancy should suggest a broth of garden snails with a dandelion salad, and an exhilarating scamper up to the round tower among the vines in the wheelbarrow drawn by the two trusty house-dogs; for as for the feudal horse-pond mantled with its frog's-bit, and the yoke of beautiful cows that are pawing on the threshold, they have well-nigh broken our hearts and caused us to commiserate the patriarch in his ark. But the maiden is straying over the meadows and singing at her distaff, the children have just run out shouting, with their pieces of bread and bunches of grapes; there dwells a gladness in the blue sky, and we, like them, will betake us to the solitude and sweet converse of the lanes and woodlands, and gaze with them on the magnificent decorations of the expiring year.

How strange it appears that the delightful summer should so suddenly vanish! While September lasted it was pleasant to sit in the urban gardens and listen to the tinkle of the bells, as the carriage drawn by its four goats in blue tags with two dogs in leash, swept past on the grand tour, and disappeared among bright lights, deep shadows and startling contrasts of colour, due to a diversity of trees there massed together and interspersed with ponds and rockeries. The *Ginko biloba* was then covered with its maiden-hair foliage, the *Desmodium pendulifolium* still drooped in fasciculated bunches of purple, the more lowly *Mattiola incana* was dotted over with its red plant-bugs, the shady magnolia walks from time to time disclosed their fleshy nectarious blossoms, and the widely spreading cedar was only just commencing to put forth its mealy flowers: whereas the fitful rustle of the bamboos, papyrus, and sturdy fan-palms, seemed to bespeak the monotony of an eternal summer. It seems but quite lately too that long, narrow barges came floating down with their hay-ricks into that modern Babel, situated on the rivers;

when man, woman and child were out on the sloping bank disporting with pitchforks and sticks, as though it were a hayfield: and it seems but as yesterday that a heavy smoke rolled up at evening from the spontaneous ignition of the damp store. It appears but quite lately that the little livid cockroaches, forewarned by the chill of an impending change, attempted to establish their colony in the hinge of the hospitable door, and when ousted by the housemaid's broom, that its minute progeny hid away in the hair brush. It lastly seems but quite recently that the house-ants, made aware by scent and by touch of the onslaught on the cockroaches, appeared like ghouls from some unknown regions, to banquet upon the dying and the dead.

Let us go down by the way of the vineyards and behold the gnarly vines rejuvenescent with fragrant and tender grapes. Many of the autumnal butterflies flutter past us in fresh array, and some of them may be accounted a prize, but until the verdant green species described in some unprocurable Russian work becomes the rage, or those which are phenominal and semi-extinct be sought for, it will be difficult, methinks, to estimate the value of a butterfly on these vasty acres. What superlative charm for the curioso is to be found in the waste of cherry blossom flaming with scarce swallow-tails, in the lucern-field ghostly with Bath whites, in a patch of dwarf furze fluttering with Arion-blues, in a heathery tract where the Meliteas are glaring like the Guernsey lilies, in the bed of pansies silvery with Queens of Spain, or in a wilderness of agrimony golden with large coppers. Is this, you nice Londoners will be prone to exclaim, that thing so new, so beautiful and so rare, that was embroidered in needlework and described so vaguely; that was heard of out at Hampstead and believed in at Epping, that used to visit the Camberwell willows and frequented the Westminster hawthorns, that was dodged over the mere and run down on the wolds? No longer smitten with withering beauty disclosed by the haze of the morning, our thoughts ofttimes in their plenitude become a weariness and a burden: let us then seek a solace in the discovery of new horizons. Over the brambles along which the big dragon-fly is hawking trail beaded clusters of fruit as large as raspberries, whose fragrant juice hornets and plant-bugs are tippling, and just within reach among the prickles there depends a sparkling object resembling a choice pear carved out of malachite. A sly sidelong glance suffices to show that this dainty morsel is a tree-frog who is breathing softly, and no artist could have conceived a happier idea of comfort than that presented by his contemplative profile as he squats huddled together with half-shut eyes.

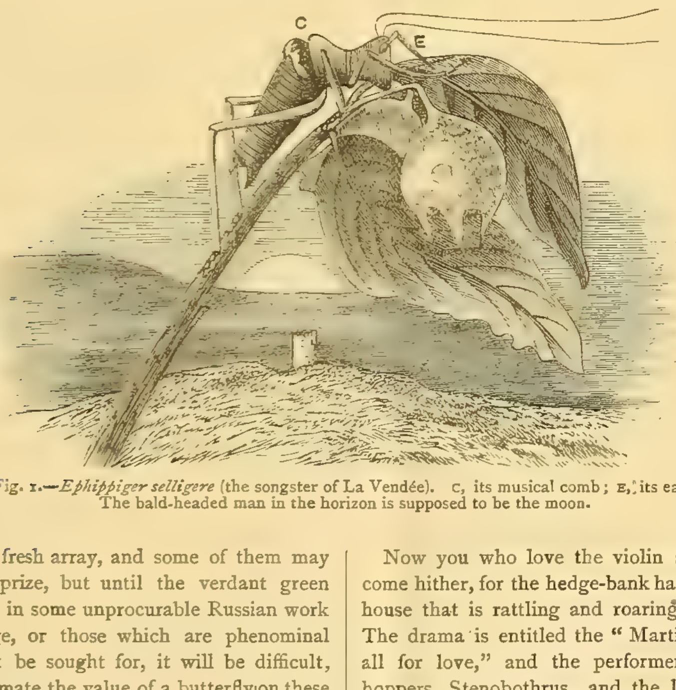

Fig. 1.—*Ephippiger selligere* (the songster of La Vendée). C, its musical comb; E, its ears. The bald-headed man in the horizon is supposed to be the moon.

Now you who love the violin and the serenade, come hither, for the hedge-bank has become an opera-house that is rattling and roaring to the orchestra. The drama is entitled the "Martinmas Summer, or all for love," and the performers are the grasshoppers, Stenobothrus, and the leaf-crickets, Decticus, Locusta and Ephippiger. The choregraphy of the one, as you will quickly perceive, is a warning trill of suppressed emotion and defiance, interspersed with tender passages composed of low and grating notes that fall somewhat harshly on the enamoured ear: that of the other is a whistling shrill of hasty passion interspersed with staccato notes that trip it lightly on the understanding. In both cases the lovers are fiery and boisterous, and their lady loves are from habit or from nature, silent, coy and distrustful; just like Madam Locusta now, who leans so caressingly on one side to catch the sunbeams with a leg akimbo. But the Signor garbed in green,

whose voice is as the rush of a cataract, has already stepped out into the vacant field of glory. See, after having flung out a defiance to his rivals, how meekly he sits upon the twig over the head of Madam, to whom he plays, and who from time to time feels hesitatingly for him with her thread-like feelers. Come, that was a gentle touch now, and none of the smart boxing which the little wood white butterflies indulge in when they buffet with their nose-pads, but Madam she won't endure it, and so she has prudently hopped aside, just as the Signor comes down with his impromptu leap and occupies her vacant place. Of course at the outset it is a little novel to be the witness of a performance where the grasshoppers who play the bass are industriously utilizing their legs as fiddle-bows, which, instead of being rubbed with rosin, have from sheer hard usage acquired a row of ivory knobs; and where the leaf-crickets who undertake the treble, are employing an ebon black comb concealed beneath the wing. And do you not remark a superb and echoing ring in the notes of Signor Locusta, who seems to chatter in absolute despair? And then as to ears, does it not strike you that such frantic love-making must needs set the whole body a trembling like the lustres of a chandelier? and it is for this very reason that the grasshoppers have theirs hidden away behind their legs; and as for the Signor and Madam, why they carry a brace sticking into the first pair like a couple of mushrooms. Our play, as you will recall, is All for love.

During the interlude the grasshoppers rattle on, and the little Dectici whirr dizzily in the hedge-roots with the tremulous sound of a watch that is being wound up. Such music becomes a trifle monotonous, predisposing you to slumber, but it finds a harmony in the dull murmur of the meadows, and what seems most strange, all the performers consider the roll of the passing cart-wheel to be a cry of encore, even saluting with a salvo the fitful chiming of the clock on the grey church tower. Perchance the wish occurs at the outset to seize and imprison one of our troop: should you think proper to do so, he would then no longer shrill his noon-tide reveries, but his ardours would kindle and flash at the evening star, increasing at the witching hour to a fusee of half a thousand notes or so. Darkness, prithee, would then acquire a new and melancholy sweetness. Meanwhile the scene has changed, for the two rival Ephippigers of the vine come stalking over the tops of the brambles, pausing as they advance to snip-snap defiance at each other, like two clicks of a steam engine, or two jingles of the horse-bells. Very elegant are these portly, hunched-backs with their white-ringed green or brown bodies, that recall the cricketing flannels and suggest a man-tiger corded with stays. Those who have chanced to catch a glimpse of the cinerous-coloured Thamnotrizon that chirps hidden in the ivy of an English hedge-bank, and which during the prevalence of the opal mist that dims the morning sun, is often out sunning in companies, will at once recognize the kettledrum wings set awry, which have conferred on these clowns the nickname of the cymbal players. But come, now, one is silent and the other is posed like an oil-beetle and executing a solo. The notes they clash and they tinkle as it were the bound of a tambourine, and their refrain is ever sweep-sweep or sweet-sweet, just as the air pulsates, and the sentiment prompts; one would think that the grape-gatherer who is reposing beneath the vine-leaves must have fairly mistaken this charming overture for the drawing of wine-corks and a rain of coin gilt with the yellow leaves. By referring to the racy scores that Yersin noted down on the solitude of his Alpine crags, it will be noticed that he assigns to these musical orthoptera an idea of number and pitch, but although this brilliant music fairly moves at the rate of a beat every two seconds, it becomes quite an open question whether the performers distinguish between a six and an eight. Apart from their marionettes they seem decidedly to be what our servant-girls would call sillies, for they are always ready to walk with a mincing and dainty pace on to the extremity of your walking-stick or umbrella. In regard to our programme, we find it further stated that Madam Ephippiger will perform a duet with the object of her choice among the gently waving vine-leaves, but for all that she is sitting on there in saucy silence, like a crocodile, and now one of her admirers—would you believe it?—has actually jumped down and bestowed on her a kiss or a bite; but Madam, after producing a squeal in imitation of that of a vindicative weasel, she has waddled off as if insulted. One would say that she was one of those who can sing and wont sing.

But do you not see, are you blind? Hist! now hist! this saddle-backed creature who is disguised in marine green, is evidently the great gun of our performance. See how dignified he holds himself aloof, embowered among the interlacing thorns, and only notice that strange rosy glow that overshadows his flattened winglets of bronze and ebon black. Hark as he spreads them like a cherub, and draws with his fiddle-bow that long, powerful and steamy note, that appears to strain in the execution like a cord that is about to snap. Hist! oh hist! Surely he must have been the apt pupil of Apollo's darling, the cicada, if a comb can be said to twang like crinoline hoops. It would seem, as he leisurely climbs to the topmost twig, that you might hear him sound his old and mellow violin fifty yards away in a fog. The Ephippigers welcome their champion, and their tambourines they dash around, and then far remote, from the tops of the pollard oaks there echoes back that Hist! oh hist! Indeed the notes of Locusta were quite overpowering at the outset, as it were the whistling gush of a waterfall after the downpour, but those of this new hunchback resemble most the

measured purl of the bubbles on the deep and strong current. Do they not inspire an absolute terror now, that would alarm the guilty conscience on a lonely heath more than the churr of the fern owl and the rattling and puffing of a thousand snakes? Fill up the cup with red wine and white wine, for he is a merry prophet of a clearing shower, and old Hesiod believed that such majestic notes, when presided over by the dog-star, betokened a heavy crop of figs and a cheerful vintage. Let us drink success to the year, and no longer carp and cavil concerning the phylloxera, the hail, and the driving cyclones. Does the new wine inspire a moody sadness, the flowers are sparse upon the meadows, the chestnuts are scattering their husks, and this requiem of the summer must indeed conclude with the literal death of the performers. "Cæsar," they seem to shout, "we die." It would be quite useless under such absolutely trying circumstances to cry Bravo, but if you seize a hair-comb and sweep along it your finger-nail, the chief musician will be sure to understand, for this strange being is so quick of hearing.

But why this dull and leaden silence? The sports, you see, are done, for the sun is sinking low, and a sudden storm of dust and rain drives hitherward, deadly, damp and cold. It will shake the pears from off the bough, and quench, oh horrors, the last sparkles of summer merriment. But what the deuce can the matter be with Madam Locusta, the star of our troop, who now dances out of the foliage for an ovation, so sleek and so plump? You would be inclined to say that she had eaten her Signor from sheer vexation or because he was by nature so very green.

Madam, who is more unassuming than a sheep, and yet more cruel by far than a tiger, will now improvise our epilogue, which runs as follows. In happy ignorance, you mortals have too long concluded that your vices were your own and that innocence was to be learnt of us, the humbler works of the creation, for man, conscious of his manifold imperfection, has been ever ready to assume that perfection, exists in everything around him. It is not then surprising that we leaf-crickets, who can claw and can bite, have by your popular writers been confused with the harmless cicadæ, for this mistake might have originated in the occasional similarity of our croaking, which is yet readily distinguishahle in its staccato notes; but when, as sometimes happens, you behold a portrait of myself, who indeed possess no violin, but have all the feminine weakness exemplified in a long ovipositor, presented to the public gaze as that of the beloved one whose food is ambrosia; we players can but ridicule the artist who has never witnessed our rural play of All for love, which is enacted every year during the prevalence of the Martinmas summer.

It may interest the naturalist to observe that Walckenær—who, in his "Faune Parisienne," alludes to the coupling of gnats, dragon-flies, ephemeræ and scolopendras, as likewise to that of spiders, cyclops, crustaceæ and hydrachnæ, and who has so graphically described the female flea reposing on the breast of her partner, her mouth applied to his mouth, and her feet intertwined with his—makes indeed no mention of the equally fantastic coupling of the subjects of this article. It is droll, to say the least, since, owing to the presence of the afore-mentioned long ovipositor, Nature has ordained that the female should have the uppermost; and as a consequence the happy possessor of her who has inspired his lays, is either hoisted into the air like a leg of mutton or ignominiously dragged along on his back. It may be likewise added that those few species of leaf-cricket which inhabit Europe are easily kept in cages or boxes covered with green gauze, since whatever may be their habits when rambling at will over the hedgerows, they, or at least their ladies, appear quite content to dine, when in confinement, on a leaf of lettuce or blade of grass, as the case may be.

A word in recapitulation. That two things should be alike and yet not alike is not mathematical, but it is the case in point with *Ephippiger vitium* and *selligeræ*. We notice a saddle-shaped thorax. The notes of the male are heard every two seconds, and the female, when in the proximity of her male, squeals like a mouse or weasel; but although the notes of either move with like rapidity, those of *selligeræ* are a sound of winding up, lasting for about two seconds, whereas those of *vitium* are momentary and dashing. Although formed alike, *vitium* is cast in the more delicate mould, and perhaps, we might add, the most specialized. Their sense of hearing is most strange; I once heard one of these creatures respond to the laugh of a saucy girl who was passing.

THE SIROCCO AS A DISINTEGRATING AGENT, WITH SPECIAL REFERENCE TO ITS EFFECT ON THE STRATA OF THE MALTESE ISLANDS.

By JOHN H. COOKE, B.SC., F.G.S.

WIND as an agent of denudation now takes its place among the most potent of those forces of Nature that are at present operating on the earth's crust, and assisting to modify the contour of its outline.

The extent of the work which it is capable of effecting, however, is not to be measured by the amount of violence or power that it exerts; for the most stupendous changes are often brought about by the instrumentality of the most insignificant causes, and what the hurricane with all of its might is powerless to effect, the zephyr, if it be but allowed a sufficiency of time, can do without appreciable effort.

Of the most unobtrusive, and at the same time the most effective of the numerous agents that are engaged

in planing down and moulding the hills and valleys of the islands and shores of the Mediterranean, the sirocco, a south-easterly wind that blows from the dry, arid regions of Africa is, perhaps the most remarkable. All of the districts situated within the Mediterranean are affected, more or less, by it. Its blighting influence on plant-life, and the depressing and debilitating effect that it has upon the human constitution, are but too well known to all those whose misfortune it may have been to have had to spend the sultry days of a Mediterranean summer within the sphere of its influence. Organic and inorganic matter are equally affected by it, but while the effect of its attacks on the former make themselves rapidly apparent, on the latter the processes that it employs in its work are slow though effective, and therefore the results to which they give rise are proportionately retarded. This is even more apparent in countries in the Mediterranean area which, like the Maltese Islands, have a comparatively small rainfall; and where the catchment basins are restricted in size. In such districts a large proportion of the denudation to which the surface contour of the district owes its diversified character, is to be attributed to the slow and intermittent, though powerful, agency of this wind.

It is along the escarpments of the hills and valleys, and in the cliff exposures that have a south-easterly aspect, that its powers of erosion are to be studied to the best advantage.

The flat-topped conical hills that form such a distinguishing feature in Malta and Gozitan scenery, owe their origin, in a great measure, to its influence. The Globigerina Limestone, the fourth bed from the top, formation forms the base of all of these hills, and on account of its homogeneity and softness of texture, it readily disintegrates before the rapid alternations of dryness and humidity that are the usual concomitants of the Sirocco.

This bed may be traced from the bottoms of all of the valleys in the Binjemma and the Gozitan plateaux, falling back in long-drawn swellings and gentle undulations; and covered with a rich and productive soil, in which the crimson sulla (clover), and the golden rye for which the islands are noted, grow luxuriantly.

Capping this bed, and still falling back in softly rounded masses are the dun-coloured marls, the taluses of which often descend the slopes to distances that are double, and even treble the real thickness of the bed. These marl outcrops are a characteristic of Maltese hill scenery. They owe their origin to the percolation of water through the upper beds, whereby the marl is rendered sodden, and then, being more susceptible to the weight of the superincumbent rock than when dry, it is pressed from out the strata, and is precipitated down the hill-sides.

The bases of the hills, therefore, have a cloak of marl which effectually protects them from aerial waste, while the upper portions, being without this protective influence, rapidly waste away before the humid winds, and thus the slopes of the valleys are seldom precipitous, and the isolated hills assume a distinctly conical form.

The hills and plateaux are thus shielded below by their own ruins, while the wasting away of the upper portions causes them to gradually assume the tapering shape with which the student of Maltese scenery is so familiar.

Unlike the Globigerina Limestone, the Upper Coralline rock is not equally susceptible to the influences of this wind. But certain portions of the strata, situated in the middle of the formation, weather much faster than do the layers either above it or below it.

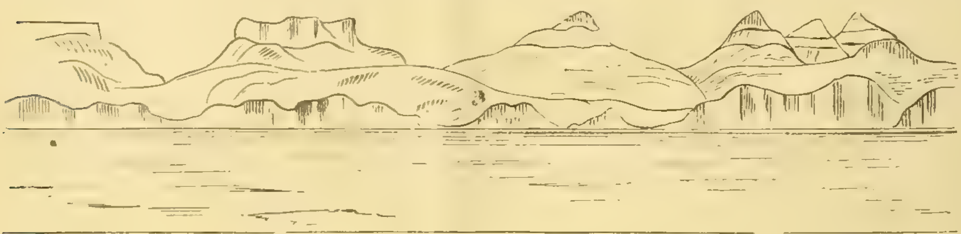

Fig. 2.—Gozo Hills, from the Sea. (N. side.)

In the majority of cases this formation is found capping the hills of both islands, and forming tablelands, the sides of which are bounded by precipitous cliffs that attain a height which is dependent upon the local thickness of the formation. It also forms the surface deposits of several undulating plains, and it frequently occurs as shapelesss hummock-like masses. These diversities of form are due in a measure to the unequal waste that the rock undergoes, as its mineralogical composition varies considerably, some parts of the strata being so hard as to be capable of withstanding the combined action of the atmosphere for centuries, while other portious readily disintegrate on exposure.

It is to this unequal action that the formation owes the craggy contour of its cliff outlines; and it is this that causes it to offer such marked contrasts to the gentler undulations of the softer beds beneath. It is from this formation, too, that the rock boulders

that strew the slopes and beds of the valleys of the islands, are derived.

The action of the sirocco and the rain upon the sand-bed that serves as the foundations of the formation, by gradually wearing it away, thus deprives the upper bed of its support, and causes the cliffs to break away in cyclopean masses, and to strew the slopes of the hills and valleys with their débris; while other masses are detached and are tilted so perilously out of the perpendicular that they appear—

> "As if an infant's touch could urge
> Its headlong passage down the verge."

Such are a few of the effects that this powerful eroding agent is, in part, accountable for; but it has been assisted in its work by other and equally powerful auxiliaries, without whose co-operation its efforts could not have been so effective. The main features of the country, the hills, valleys, and gorges have had their direction and extent largely influenced by the lay of the strata; while the minor ones, such as the honey-combed and fretted appearances presented by the cliff-faces and rock-surfaces, have been influenced by the lithological characters of the rock. These are some of the assistants that have co-operated, add to which the heat and drought of summer, and the wet and cold of winter.

But effective as they are as helpers in the work of waste, no single one of them can be pointed to as being more potent, more active, more irresistible than the sirocco.

Both in Malta and in Gozo the principal valleys lay in a north-west and a south-east direction; that is to say, they lie in a line with the direction of this wind.

Marsa Sirocco, an extensive bay on the east coast of Malta, so called because this wind blows directly into it, owes its origin and extent to its agency. It is the largest bay in the islands, and has four valleys abutting on its coast-line, each of which lies in the same direction. But it is not only in the general moulding of the country that the sirocco is concerned. Its effects may be traced in every crag and cavern, and on every rock, boulder, or other rock-surface. The irregular blocks of which the walls that serve as boundary-partitions between the fields, and the tooled stones of which the edifices in the towns and casals are built afford equally striking evidences of its powers of erosion; and by their means both the rate and the amount of the denudation may be estimated. It is a noteworthy feature in the exteriors of Maltese walls and houses that the side that is exposed to the sirocco always presents a very eroded, time-worn and dilapidated appearance, whereas the other sides, in comparison, are fresh and unworn.

It is no uncommon occurrence to find the softer stones in the sides of the houses that have a south-east aspect, almost completely worn through, and surrounded by other blocks, the harder portions of which such as the fossil contents, echinoides, pectens, etc., stand out in bold relief from their worn and wasted matrices. In the old fortifications that were erected by the Knights of St. John, such phenomena as these are of frequent occurrence, and are very typical of sirocco denudation.

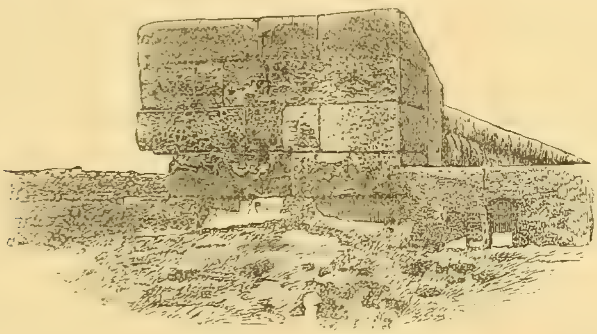
Fig. 3.—Effects of Sirocco abrasion on ruins.

From a series of calculations that I have made of the rate of the erosion of the Globigerina limestone blocks in a number of buildings and fortifications of known ages, I estimate that the rate of sirocco denudation averages $\frac{2}{25}$ of an inch per square foot per year; that is about 16 cubic yards per acre per year; or about 22 tons of material are annually wasted from every acre of surface.

In calculating this, numerous examples were taken, some being in proximity to the coast, while others were obtained from the centres of both islands. By so doing I believe I have obtained a fair average rate, for there can be no doubt, but that the rate of erosion is more rapid near the coast than it is inland. The moisture-ladened winds that sweep over the islands impregnate all that they come in contact with; and the Globigerina rock being very porous, is therefore highly susceptible to its influence.

The duration of time during which the sirocco lasts is seldom long enough to enable it to do more than affect the surface, and then the period of

moisture is usually followed by conditions that are diametrically opposed to those that prevailed while the sirocco was blowing.

The frequent and rapid changes that the stone thus undergoes, causes an abnormal expansion and contraction of the superficial molecules, and so tends to make the surfaces readily disintegrate and peel off in large flakes.

The work of erosion is greatly assisted also by the crystallization of the salt contained in the moisture that this wind takes up in its passage across the Mediterranean.

This moisture renders the stone surfaces highly saliferous. Under the influence of the heat of a semitropical sun, the moisture passes off, and the salt crystallizes and pushes out the superficial particles of the limestone, thus facilitating the paring down process which so rapidly wastes the rocks, and causes them to break up.

NOTES AND OBSERVATIONS ON *CHELONIA CAJA*.

By H. Durrant.

THE following paper consists merely of extracts from my diary and notes made at the time of observation and experiment. I do not claim any great originality for them, as most of the experiments were made to prove statements made by more distinguished workers than I, but still, perhaps they will be found interesting and probably new to some readers. The larva which I kept for observation was one of the commonest I could procure, both as regards itself and its food. The cages were made of fine gauze with glass fronts, which are easily and cheaply constructed, filled to the depth of about two inches with fine mould, in the middle of which was fixed a small glass, about four inches high, half-filled with water. Into this the branches of food-plants were put. For isolation I obtained some ordinary cardboard starch-boxes, cut out an oblong hole from the lid and fixed on the under surface with "Kay's coaguline," a quarter-plate negative glass (cleaned of course); a number of holes were then pricked in all over the box, for the free admittance of the vital principle, air.

On April 24th, I went out in quest of the caterpillars of the tiger-moth (*Arctia caja*), and after traversing several miles and getting splendidly nettled, I brought home about thirty, principally taken from the nettle (*Lamium album*) and the dock. I also took several from a small patch of moschatel (*Adoxa moschatellina*), which was in flower at the time. I have never met with any lepidopterous larvæ on this plant before, nor do I remember having heard of anyone else finding larvæ on it, but on this point I should like to hear other correspondents' experiences. At first I thought I had several different species, as in some the hair was extremely short and in small tufts, but to make up for this shortcoming, as it were, the spiracles were very visible. In others the hair was very long and of a silky appearance. I placed them all together in a cage and left them with some food. Next morning when I came to examine them, I found scarcely any with the short tussocks of hair and large spiracles, but the cast-off skins were plentifully strewed about the sides of the cage. Later in the day I saw several more change their skin. Just before changing it they invariably attached themselves to the side of the cage by a silken thread, and the empty skin would remain there after the larva had escaped and assumed its new coat. After they have done so they look wet and miserable, and their hair seems matted together as it would be if they had been dipped in water. But they soon dry themselves, when they appear very handsome in their silky coat. In about a week they had all been through the operation—painful it would seem—of changing their skin. During the earlier stages of their voracious life, and just before changing, they would scarcely eat anything, but when they reached what I may term the long-hair stage, they ate ravenously, comfrew, nettle, dock, horse-raddish, *Mentha rotundifolium*, and in fact nearly anything I could supply them with. I fed them sometimes twice and three times a day, such was their insatiable appetite. Burmeister mentions the fact that beetles and their larvæ never consume the leaf from the margin, like the caterpillars of Lepidoptera, but bite a hole in the centre, round which they feed, thus distinguishing the destroyer merely by the appearance of the leaf. This certainly must be a fallacy. Lepidopterous larvæ not only feed from the edge of the leaf, but as often as not will commence in the middle, though generally from beneath. This must be a common occurrence to those who have kept larvæ in confinement. As to the beetles they certainly do feed from the middle of the leaf, but they are frequently to be seen feeding from the edge. Go out some summer evening with a lantern and examine the leaves of any common plant, and you will be able to verify this statement. So that the appearance of the leaves is in no way calculated to apprise the student of their respective invaders. Another item of importance is the following. Most entomologists agree that there are few lepidopterous larvæ, if any, which prey upon each other. But while I kept Chelonia I found that when a larva had just pupated, and while the external skin was soft and moist, the larvæ would gather round it, bite pieces out of it, and apparently eat them, leaving afterwards a dry, deformed, shrivelled up shell. This occurred while the cage contained plenty of food, so that hunger cannot be thrust in as an excuse. Not only this larva, but a number of others which I have kept at various times, particularly the common turnip-moth, have exhibited the same propensities. If, however, the skin of the

pupa has hardened before it has been noticed, it remains perfectly safe. Here, I know some of my readers will say, "How could they get at them when they are enclosed in a strong web?" But numbers of mine changed amongst their food on the floor, contrary to their usual habit; but if a weak place appeared in those that did spin a web, it was quickly attacked by several of the larvæ, and an inroad soon made. The following trait is also interesting, as bearing on their sense of smell. I found when I gathered fresh food for the larvæ in the early part of the morning, and placed it in their compartment, that they flocked eagerly towards it, leaving their stale food, on which most of them were feeding before. But if I fed them later in the day, the majority of them stayed on the stale food, although the fresh food was repeatedly placed in close proximity to them. It may be that the dew has something to do with this by drawing out the scent of the plants, especially as I fed them mostly on Mentha (principally rotundifolium), horse-raddish, and comfrey.

July 1st. The imagos appeared and I found that I had a number of very fine specimens. By mishap I allowed several to remain in the cage, which was put away in an old cupboard. Going to the cupboard, nearly five weeks after, I found that one was still alive, but the other four had succumbed—and remember, there had been no food in the cage during this period, nothing but the layer of soil on the bottom. How the one lived I cannot imagine. On the gauze at the top, I found ova had been deposited in a considerable quantity, and further—that they emerged in a few days after. The small larvæ were not undersized or weakly either, as one would expect from the treatment the imagos received, but were rather over the ordinary size at this period. I send specimens to the Editor of the larvæ at one day old. The influence of light on their development I tested in the following way. I enclosed the young larvæ with the food-plant in a dark box, with holes for the free admission of air, and stored it in a "dark room" used for photography. They were kept well supplied with food. The development of each stage was considerably retarded, so that specimens in the last stage (I cannot call them imagos) were not obtainable till the September following. Not one, however had its wings fully developed, some barely the eighth of an inch in length. The longest was half an inch, and I believe, if growth had continued, the wings would have been entirely dark brown. For this experiment I selected strong, healthy-looking caterpillars, so that it is all the more conclusive as to the bad effects of darkness on their perfect development. The influence of heat on the wing at the time of expansion is also, it would appear, decidedly bad, drying up the juices as fast as they can be formed, till the wing is made dry and brittle, and incapable of attaining its full size. I reared some over a hot mantel-shelf; few of these but whose wings did not present the appearance of shrivelled deformity. The great strength in a few cases had endowed several for this struggle for existence, it is true, but they were certainly not perfect specimens. Most Lepidoptera you will thus find emerge from their chrysalis in the cool of the evening, so as to escape the hot sun and dry air. Those I kept emerged about eight or nine in the evening or during the earliest hours of the morning. A red liquid, acid substance is found plentifully sprinkled about the cage after such emergences, and is used in softening the hard, dry case, so that it can easily be parted by the moth, and a passage made when it wishes to appear. In one case only did the pupa case remain attached to the imago's body; it did not, however, survive, but died shortly after emergence.

THE HUMAN BLOOD-WORM (*FILARIA SANGUINIS HOMINIS*).

IT has been suggested to me that I might bring together in a note the materials I have collected regarding the Filariæ found in human blood; and the more so as circumstances have admitted of my obtaining several living specimens of the parasite, from some of which my sketches have been made. So far as I have been able to ascertain, the subject has not been illustrated in SCIENCE-GOSSIP; my note may, therefore, serve to fill a vacant place.

In 1870 Dr. T. R. Lewis, formerly of Calcutta, and since deceased, found nematoid worms in chylous urine. In the beginning of 1872, whilst examining the blood of a native of India—a patient in the Calcutta Medical College Hospital—who was suffering from diarrhœa, Dr. Lewis observed no less than nine minute active worms on a single slide, and identified them with the Nematoids previously obtained by him in cases of chyluria. From this time onwards he paid considerable attention to the subject; and he sent a slide containing some specimens of the worm to Professor Parkes, at Netley, who showed them to Mr. Busk. The name *Filariæ sanguinis hominis* appears to have been then conferred on this organism. During the course of the two following years Dr. Lewis continued his investigations, with the result that he traced Filariæ directly to the blood in ten, and detected them in various tissues and secretions in at least thirty cases; the parasites were always associated with chyluria, elephantiasis, or some closely allied pathological condition. In one case (of chyluria) the patient had been a leper for fourteen years: several slides containing active Filariæ were obtained from his fingers and toes.

Dr. Cooke in his instructive and popular little book on "Ponds and Ditches" appears to suggest that Filariæ are pathogenetically associated with leprosy, a view which scarcely derives support from

Lewis's investigations, who doubtless found them in a case of leprosy, but the patient was also suffering from chyluria. The Nematoids are admittedly closely related to the latter disease; and seemingly only accidentally so to the former. Here we may note that leprosy was known to the Greeks as elephantiasis, and to the Arabians as lepra; but that it differs from the lepra of the Greeks, and from the elephantiasis of the Arabians. *E. Arabum*, or lymph-scrotum, and chylous dropsy of the peritoneum and tunica vaginalis testis, than with leprosy. The presence of the Filariæ, whether in the blood, the tissues, or the secretions, points to abnormalities in the lymphatic system, the result of long-continued residence in tropical climates. They utilize the mosquito as an intermediate bast; and in one of his papers on the subject, Lewis described the changes undergone by the Nematoid in the alimentary

Fig. 4.—*a.* Leucocytes (stained with roseine); one with three nuclei. *b.* Filaria, with tail retracted in sheath.

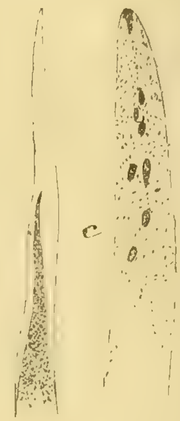

Fig. 5.—*c.* Filaria, head and tail of *b* more highly magnified.

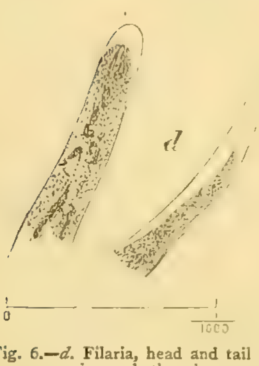

Fig. 6.—*d.* Filaria, head and tail of another specimen; both ends retracted.

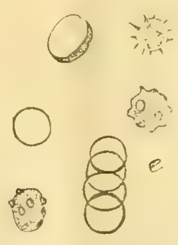

Fig. 7.—*e.* Crenated red corpuscles associated with the Filariæ delineated above.

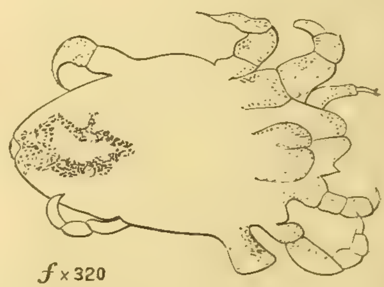

Fig. 8.—*f.* Sarcoptes, moult obtained from same blood.

N.B.—*a* and *b* were drawn under an $\frac{1}{8}$ in. objective, and to one scale; *c, d* and *e* under a $\frac{1}{18}$ in. and to another; *f*, was drawn under a $\frac{1}{8}$ in. at 10 in., and magnified 320 diameters.

Barbadoes leg, is a tropical disease prevalent in Arabia, Africa, and India, and causes the legs to swell to an enormous size, hence its name; but its symptoms differ from those of leprosy. While, then, the evidence indicates that elephantiasis is closely associated with Filariæ, leprosy seems to be related pathogenetically to the bacillus discovered by Hansen, *B. lepræ*. It may, therefore, be safer to associate the Filaria with chyluria, elephantiasis, soft tumifaction of the inguinal glands, hæmatochyluria, canal of that insect. Is it possible that the mosquito is instrumental in introducing the worm into the capillary system of men and other animals, whence it passes into the lymphatics, where it finds a lodgment? That it is not injured by the poison peculiar to the mosquito is proved by its passing alive and continuing its developmental changes in the body of the mosquito. It must also be remembered that Filariæ have been found in diseased conditions of the human body alike in the East and West Indies,

in China, Africa, the Mauritius, Bermuda, Brazil, etc., all mosquito countries.*

The organism described in this note is a filiform, parasitic Nematoid, about $\frac{1}{75}$ in. in length, and $\frac{1}{3500}$ in. in transverse diameter; it resembles the familiar Anguillulæ found in stagnant water, damp moss, etc. It, however, differs from these in being enclosed in a hyaline sheath, in which the worm can be seen to elongate and contract itself. It is difficult to make out the internal organization of the Filariæ, the alimentary canal is not distinctly traceable, and the contents are mainly granular with a marked condensation in parts. Dr. Lewis considered the Nematoid as he found it in man, to be an embryo, and his later investigations brought the adult form to light. The mouth-parts have puzzled me; my sketches from two worms, both obtained alive, indicate differences of structure, or of position; but the examination of other specimens has not cleared this up. The hyaline external sheath is often markedly apparent; and in dead and stained specimens, the body is generally contracted in it at one or both ends: my drawings illustrate this feature. The person from whom I obtained my specimens suffers from general debility and hæmorrhoids, and occasionally from a mild form of eczema; but in all other respects he can be said to be in fair general health. The mode of obtaining the worm from the blood is simple enough. The end of the finger is tied round with twine or pack-thread, and when slightly congested is lightly pricked with a sharp sterilized dissecting needle. The droplet of capillary blood thus secured is taken up on one or more clean cover-glasses, and pressed out as thin as possible on a cleaned slide. A half-inch objective suffices as a finder; but a Zeiss D, or an Economic $\frac{1}{8}$ in. is necessary for the detailed examination of the worms. These were the powers used by me; though my drawings were made under a student's $\frac{1}{8}$ in., and a Seibert's $\frac{1}{16}$ in. w.i. In all cases the illustrations have been drawn with the paper at a greater distance from the eye-glass than the normal ten inches. This has been done merely to get larger figures and details. The Filariæ continue in active motion for many hours. As a stain roseine will be found to answer the double purpose of killing the worm, and also of staining it. In blood from the same person I have twice, on separate occasions, found what I took to be the moult of one of the Sarcoptes. There was no itch present, and it was denied that there was any previous history of the complaint. Are these Sarcoptes to be regarded as pathogenic to the form of eczema which does occasionally trouble the patient?

The prevalence of the latter disease at times in Bengal, leads one to enquire if some skin complaints distinguishable from itch, and termed eczema, may not be contagious, and caused by a parasite?

Numerous red blood corpuscles in the case I have in view are crenated, a few curious abnormal forms being delineated in my drawings; but for this feature the Filariæ may not be responsible.

Dr. Lewis's investigations led to his examining other animals, with the result that he obtained allied Nematoids from the Indian pariah (or native street-) dog, and the Indian crow. More than one-third of the dogs he examined were thus affected, the Nematode in them being smaller than in the case of the human parasite; while the blood of one half the crows he examined also swarmed with Filariæ, which were about one-third the length and one-half the width of the human parasite. In the Nematoids from both the crow and the dog there were no indications of an enveloping hyaline sheath; and in the canine worm the internal structure was in his opinion slightly more advanced in respect to differentiation etc., than in the human worm. Lewis also examined mosquitoes, and was able to obtain a constant supply of these insects in a filarious condition from a room occupied by five servants, one of whom harboured Filariæ in his blood. This man had been in the place for several years, and was not known to have suffered from any special disease. I have myself succeeded in finding filarious mosquitoes, but under circumstances which, as in the case of Dr. Lewis's servant, readily explained their presence. He repeated the experiments of Dr. Manson of Amoy (China), and discovered that fourteen per cent. of the mosquitoes he caught at random had Filariæ, which he considered a proof that in Bengal filarious blood cannot be very uncommon. As he points out, it is necessary in examining mosquitoes for these Nematoids to observe whether the blood in them is mammalian or avian. The following details are based on Lewis's papers, and may be useful.

		Length.	Habitat.	Form.
		In.		
Filaria . . .	Sheath	$\frac{1}{75}$	Blood . .	Head round, tail pointed.
Embryo guinea-worm . . .	None	$\frac{1}{32}$	Cellular tissue	Ditto
Trichina . .	None	$\frac{1}{25}$	Muscle .	Head pointed, tail blunt.

A few sentences in conclusion with regard to the milder forms of Filariosis (the term applied by Lancereaux to the deceased condition caused by the Filariæ), may be interesting and appropriate. Lancereaux, who has given a complete *résumé* of the whole subject, considers the parasite enters the system by the alimentary canal, and he recommends

* The Filariæ come to the surface of the skin between five and six o'clock in the evening, and seven or eight o'clock in the morning, so that they are handy for mosquitoes during the hours when those insects are most numerous. The worms retreat into the tissues during the day. Though eyeless, they seem to possess a *light-sense*, and to avoid light. What effect would the long Polar day have on these parasites, in which periodicity is such a marked characteristic? Would it puzzle them out of existence?—W. J. S.

the use, as a prophylactic measure, of boiled and filtered water. Others hold that the parasite finds its way into the body through the skin of bathers. To what, if any, extent is the mosquito to be regarded as an infecting agent? In this connection, too, does food count as a factor? Both the pariah dog and crow are foul feeders; though it should be added that in our hot tropical climate, they are both bathers, and both drinkers of stagnant and other possibly contaminated water. Moreover nematoid helminths, as Lewis showed, have been found by other observers in the blood of the carp, hawk, jackdaw, jay, frog, seal, and whale. The dog seems, however, to take the first place, and has been observed to be thus affected in nearly all parts of the world, but notably so in China, India, and Southern Europe. Is the dog an infecting agent in this case, as he is believed to be in the case of tape-worm?

It is satisfactory to be able to add that in man the prognosis is favourable, even though the disease be of some standing. Removal from the source of infection is said to result in a spontaneous cure. As remedies, inunctions of mercurial ointment, in connection with hydrotherapy, and the injection of certain parasiticides into the lymphatic ganglia, have been recommended. A writer in Ceylon considers that the administration of bisulphide of carbon gives satisfactory results, owing, in his opinion, to the sulphur ingredient, and its power to prevent the multiplication of the worm in the body.

On the other hand, Dr. Manson's views with regard to the pathological significance of the Filariæ, which receive support from the observations of Dr. Lewis and others, are opposed by Dr. Rake of Trinidad, who failed to find Nematoids in cases of elephantiasis and chyluria; and by Dr. Sibthorpe, who examined the blood of patients affected with hard elephantiasis, and did not meet with Filariæ. The doctors evidently differ as to the pathogenetic value of the worm; but its existence as a parasite in the blood of man has been proved, and it remains to be ascertained definitely, how it gains a footing in the body. Those who wish to prosecute the subject further will derive valuable aid from Dr. Lewis's papers republished in Part III. of his "Physiological and Pathological Researches" (1888), and also in Dr. Sajou's "Annual of the Universal Medical Sciences," Issue of 1889, vol. i., F, page 13, and vol. v., A, page 145; and the various papers therein referred to. One cannot read up the subject without being impressed with the value for diagnostic purposes of a microscopical examination of the blood.

W. J. Simmons.

Calcutta.

We commend to the notice of our natural history book collectors, Messrs. Dulau's Catalogue of Zoological and Palæontological books, just issused.

SILLOTH IN AUGUST.

By W. H. Youdale, F.R.M.S.

Having read with great interest the two articles by the Rev. Hilderic Friend, F.L.S., on Silloth in April and June, 1889, (Science-Gossip, vol. xxv. pages 125 and 156), I was led to imagine that some of your readers might be interested in knowing what can be found in that apparently forsaken-by-naturalists district in the month of August; perhaps, also, these articles may be the means of inducing some other botanists and naturalists to take some interest in working up the flora and fauna of this seemingly neglected and barren neighbourhood.

It is needless to repeat the descriptions given by the Rev. H. Friend of the sand-dunes, general appearance, and situation of this charming little sea-port and watering-place combined; therefore I will proceed to describe and enumerate the chief objects of interest to be found there, or likely to be found there, during the month.

My visit commenced on the 11th and ended on the 24th; one or two days were very stormy, and rain fell on most days—only two, I believe, were exempt—so that, on the whole, the weather was most unpropitious for insect-life, and I cannot in consequence add anything worth recording to what has already been given in the articles above referred to.

The plant-life, however, was a pleasant surprise, as many as 116 varieties being found by my wife and myself—sixty-one of which are not to be found in the neighbourhood of my residence on the border of the Lakes District. Some of the chief finds were, *Aster tripolium*, (found near Skinburness), *Convolvulus sepium*, *C. arvensis*, *Brassica monensis*, *Silene maritima*, *Gnaphalium minimum*, *G. uliginosum*, *Rumex crispus*, *Eryngium maritimum*, *Galium mollugo*, *Chenopodium ficifolium*, *Medicago lupulina*, *Artemisea vulgaris*, *Atriplex angustifolia*, *Viola curtisii*, *V. canina*. Behind the sheds built near the docks I found a solitary specimen of wild chicory (*Cichorium intybus*), two or three specimens of *Echium plantagineum*, and large numbers of *Echium vulgare*. A fine *Ranunculus hirsutus* was considered a "good find," on account of its rarity in the district. The round-leaved mallow (*Malva rotundifolia*) is here in great plenty, as is also *Jasione montana* and the beautiful hare's-foot trefoil, (*Trifolium arvense*).

A walk to Skinburness proved most interesting, and resulted in finding *Geranium sanguineum* in full bloom and great profusion, the Burnet rose (*Rosa spinosissima*) and its curious irregular red galls, caused by *Rhodites spinosissima*, were most entertaining, a single specimen of corn marigold (*C. segetum*), and the following in plenty: *Sedum anglicum*, *Spergula arvensis*, *Armeria maritima*, *Cakile maritima*, *Arenaria peploides* (on the sands), *Sagina maritima*,

Persicaria lapathifolium, *Erodium cicutarium*, and *Geranium dissectum*.

A walk in the direction of Allonby, past the "Convalescent," added these to the list: *Calamintha officinalis*, *Lamium album*, *Polygonium rayii*, *Stachys palustris*, *Plantago coronopus*, *P. maritima*, *Senecio aquaticus*, *Ononis procurrens*, *O. spinosa*, *Crithmum maritimum*, *Salsola kali*, *Tanacetum vulgare*, and *Anthyllis vulneraria*.

Taking a journey from Silloth to Bowness-on-Solway proved most delightful and added some grand finds, amongst which was *Typha latifolia*, growing in water near a brickfield by the railway side at Kirkbride. On reaching Solway Moss, *Hirsutum vaginatum*, *Hieraceum paludosum*, *Nasturtium terrestre*, and *Eleocharis palustris* were observed. Both sides of the railway were lined with *Epilobium angustifolium*, which grows to the height of six feet and upwards, looking very lovely when passing it in the train. I was told by a "native" that it rejoiced in the local name of "Blooming Sally," and at Silloth is known as "French Willy" (an evident corruption of "Willow"). The thyme-leaved speedwell, *Veronica serpyllifolia* is perhaps the greatest gem to be found at Bowness. I also found by the railway-side *Vicia hirsutum*, *Dianthus plumarius*, and *Sedum telephium;* the last two have probably been planted and allowed to become wild, or perhaps seeds may have been blown by the wind from some garden not far away.

To return to the Silloth flora, the plants met with in greatest number are *Bartsia odontitis* (very large specimens), *Matricaria inodora*, *Euphrasia officinalis*, *Lamium purpureun*, *Senecio vulgaris*, *S. Jacobœa*, *Plantago major*, *P. media*, *Thymus serpyllum*, *Trifolium pratense*, *T. repens*, *Campanula rotundifolia*, *Capsella bursa-pastoris*, *Hypericum perforatum*, *Mysotis palustris*, *Bellis perennis*, *Veronica beccabunga*, *Vicia sativa*, *Papaver dubium*, *Ranunculus acris*, *Galium verum*, *Potentilla anserina*, *P. reptans*, *Arctium lappa*, *Cytisus scoparius*, *Ulex europœus*, *Calluna vulgaris*, *Erica cinerea*, *E. tetralix*, *Taraxacum dans-leonis*, *Lotus corniculatus*, *Cerastium vulgatum*, *Tussilago farfara*, *Achillea millefolium*, and the inevitable *Sisymbrium officinale* (hedge-mustard).

The two most observable peculiarities of the Silloth flora are, first, the very large preponderance of blue flowers, such as hare-bells, viper's bugloss, sheep's scabious, vetches, speedwells, and violets, growing in such large numbers as to make quite a blue carpet; second, the way in which each variety of flower seems to appropriate a little piece of ground to itself, to the exclusion of all others, so that a plant may be in great profusion at one place and yet not be met with again within a distance of two miles.

The seaweeds are of the very commonest description. All I found were *Fucus canaliculatus*, *F. vesiculosus*, *F. nodosus*, and its usual parasitic *Polysiphonia fastigiata*, *Melobesia polymorpha*, *Griffithsia corallina*, *Ulva latissima*, and *Enteromorpha compressa*. I also found the zoophyte *Flustra chartacea*, but not in abundance.

The best finds among the Diatoms were *Pleurosigma œstuarii*, *Navicula crassinervis*, *Surirella gemma*, *Nitzschia sigma*, and *N. valida*, all on or near the pier.

A word in conclusion about the grasses; the three principal ones are *Carex arenaria*, *Triticum junceum*, and *Ammophila arundinacea*, protected by Act of Parliament, first in Scotland, and then in England also. Heavy fines and penalties were imposed on anyone gathering the spikes or leaves of the plant, or having any part of it in their possession. These laws have not been repealed, but they have long fallen into disuse, for now various articles for domestic purposes are made from the stems of this plant, every stem thus used is a direct infringement of the law.

NOTES ON THE GENUS DISTYLA, CLASS ROTIFERA.

SOME time ago (September 1890), I contributed an article to SCIENCE-GOSSIP with the above title. In that paper I described two new species of Cathypnæ, which, when fully extended, had so many of the characters of the genus Distyla, as drawn by Mr. Gosse, that it gave rise to a suspicion which I stated in the following words: "It is of course possible that Distyla may be a good genus, but I think it is at least probable, that *some*, if not all, the species of that genus have been described from extended Rotifera of the genus Cathypna." At that time, although I was familiar with several species of the latter genus, I had never seen any of the recorded species of Distyla, and my notes were written in the hope "that those microscopists who have the opportunity will take up the investigation of the subject; and, whether the result be to confirm the genus, or my suspicions as to its non-existence, my purpose in writing these notes will have been accomplished." In your September number, 1891, Mr. D. Bryce has a courteous criticism of my article, to which I should have replied earlier but for a press of other work. There are so many points upon which Mr. Bryce and myself are agreed that I only propose touching lightly upon one or two, in which there is a difference of opinion. I am glad that Mr. Bryce "is inclined to deny credence to the remarkable position" of the supposed "inability of the species of Distyla to withdraw its head between the plates of the lorica," because I expressed equal incredulity. At the same time, I think I was justified in concluding that Mr. Gosse by the phrase "habitual protusion of the head," intended to convey the idea that in Distyla the corona was never retracted. I was confirmed in this interpretation, unaccountable as it appeared, by Mr. Gosse's known precision in the use of language; by referring to his figures, where *all* the six species

are drawn with the "head" protruded; and by the significant remark of Ehrenberg, that his *D. Hornemanii* was "capable of retraction," showing to my mind that he also understood that the other species of the genus were *incapable* of retracting the head. I quite think that under such confirmatory coincidences I was justified in my assumption. I am now quite convinced, both from Mr. Bryce's experience of the genus, and my own subsequent acquaintance with it, that Mr. Gosse could only use the phrase in the sense indicated by Mr. Bryce. With reference to my omission of the word "lengthened" in my quotation, it was, as he suggests, quite unintentional, and I cannot understand how it occurred, as I find it in my original paper. There is one point in which I am sorry to have to differ from Mr. Bryce, but I am still of opinion that my two new species are Cathypnæ; the lorica being "sub-circular," or as he puts it, "ovate," and not of the form of a "long ellipse." Another critic of my paper has to some extent misunderstood my point, and most certainly misjudged the spirit in which my notes were written, and as he is quoted by Mr. Bryce, I reply to his chief criticism here. In the first place, he makes the statement that, "The distinction (between the two genera) is plain enough." Now while I readily admit that typical species of any of the genera, may easily be distinguished from typical species of even closely allied genera, yet with those species near the borderline it is frequently "not plain" on which side they ought to be placed. In this very genus, the only new species Mr. Gosse admitted into the body of the work was *D. flexilis*, and of this he says in one place, "I add doubtfully" and in another, "I am not by any means sure that this is entitled to specific rank; nor, if so, whether it ought to be placed in the genus Distyla." My critic then points out the distinctions between the two genera in the words quoted in SCIENCE-GOSSIP by Mr. Bryce. "In Cathypna the whole trunk is loricated, but in Distyla only the hinder-portion of the trunk is loricated, the fore part having a membranous covering." It is a very strange circumstance that in no place does Mr. Gosse mention such a distinction, never even hints at it; and if my critic means anything more than that Distyla can exert rather more of its frontal part than most loricated Rotifera, then his distinction is not a fact. Mr. Gosse does say that the lorica is "membranous before," but he figures it as having a well-defined anterior margin, and it will be noted, he designates the whole of this "the lorica." However, through the kindness of Mr. Bryce and another valued London correspondent, I have had the pleasure of studying two undoubted species of Distyla, both, however, new forms, and I am perfectly satisfied that the genus is a good one. These two species were very characteristic, and no microscopist who had any experience in this class of animals could for a moment have mistaken them for Cathypna. They had the "lengthened and flattened form," and the activity so unusual with other Rotifera of the family Cathypnadæ. The chief and most obvious distinction, however, is the form of the lorica, which in Distyla is a long oval. In conclusion, while candidly admitting that I was wrong in my supposition, I think that my previous notes are of value, as showing that there are some species of Cathypna which, when fully extended, so strongly resemble Distyla, when fully extended, that great caution is necessary in assigning them their place, and before doing so they ought to be studied in both conditions.

J. E. LORD.

Rawtenstall.

OBSERVATIONS ON *PHALLUS IMPUDICUS*.

THIS fungus, *Phallus impudicus*, the stinking morell, or stink-horn (Fig. 9), may usually be found amongst the roots of chopped-down trees

Fig. 9.—*Phallus impudicus*.

and shrubs, especially the beech and hornbeam, in damp, shady woods and copses; less frequently I have

found them on shady and grassy banks, on heaths in thei vicinity: they are very abundant in some woods, for instance in Bury Woods, Epping Forest, they may

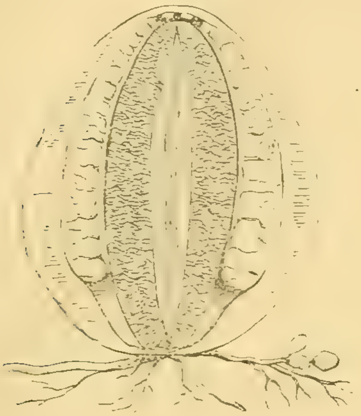

Fig. 10.—*Phallus impudicus* before the bursting of the peridium.

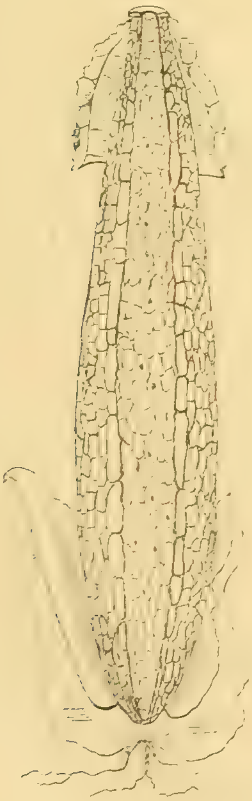

Fig. 11.—*Phallus impudicus* (Section).

be found growing in clusters under the hornbeams; and also in several other woods near London.

They first appear as an oblong, whitish, transparent ball (Fig. 10), which will soon burst; from out of this gelatinous covering (volva) rises the tubular column, which has a spongy texture of a milk-white colour; on the apex of this column or stipe is the common receptacle or pileus, at the summit of which is a small white bordered pore, marking the conjugation with, and opening into the column. At first the sporiferous head is green, without any traces of the laminæ, but when ripe the spores escape in a yellowish-brown mucus, leaving the common receptacle and laminæ quite clean. It has a very strong fetid smell, especially when the peridium bursts and the column expands, by this smell it may often be found.

They are most abundant about July and August, growing in clusters of threes and fours, which are generally from six to eight inches high, and smelling very intense; however, later in the season (October), the individual specimens are fewer and much larger, often nine and ten inches high, with a very slight smell. I think this must be due to the weather being more favourable to the growth of fungi.

The following is an account of a very large specimen which I found in October this year, growing on the borders of a wood at Highgate:—height thirteen inches, pileus three and a half inches long, column two inches in diameter, and volva four inches long and half an inch thick.

HENRY E. GRISET.

SOME FAMOUS COLLECTING-GROUNDS FOR DRAGON-FLIES.

By the Author of "An Illustrated Handbook of British Dragon-flies," "A Label List of British Dragon-flies," etc., etc.

I. THE NEW FOREST AND NEIGHBOURHOOD.

THE New Forest, in Hampshire, is probably *the* "happy hunting-ground" most-frequently patronised by entomologists in the British Islands. From the earliest dawn of entomological history this district has been regarded as the principal store-house of insect-life in this country, whose boundless expanse it is the desire of every enthusiastic entomologist to explore. It constitutes the headquarters of all the "brethren of the net," and, as in times of yore, it still continues to yield its multitudinous winged treasures to the patient and persevering student.

Nowhere else in the United Kingdom is such a veritable paradise for dragon-flies to be found as in the New Forest, and everywhere through its vast length and breadth we may hope to meet with these gorgeous gems, provided only that we pay it a visit in the proper season.

The neighbourhood of Brockenhurst, which is in the very centre of the Forest, and exceedingly convenient to reach from either Southampton or

Bournemouth, is a very good collecting-ground for these majestic creatures; it abounds in ponds and clay-pits, some of which are situated on the common, others in the surrounding woods, while there are several first-class streams and brooks in the immediate district, all of which teem with dragon-flies.

The neighbourhood of Lymington, Ringwood, and Lyndhurst also, are famous habitats for many kinds, while several species swarm on the reedy river at Beaulieu, between which village and Lymington there is a very large pool called Sowley Pond, which may also be visited with very successful results.

The following species of dragon-flies have been known to occur within the boundaries of the New Forest, namely, *Platetrum depressum* (very common), *Lepletrum quadrimaculata*, (very abundant), also its beautiful austral variety *prænubila* (which is very common as well), *Libellula fulva* (very rare and local), *Orthetrum cærulescens* (plentiful), *Sympetrum vulgatum* (exceedingly abundant, occurring in thousands in certain seasons), *S. sanguineum*, *Cordulia ænea*, (not uncommon, principally found in the neighbourhood of Brockenhurst and Beaulieu), *Oxygastra Curtisii* (occurs at Brockenhurst, but is rare) *Gomphus vulgatissimus* (not uncommon in the vicinity of Brockenhurst), *Cordulegaster annulatus* (very plentiful on most of the rivers and brooks), *Anaso formosus* (rare), *Brachytron pratense* (local), *Æschna cyanea* (abundant everywhere), *Æ. grandis* (not uncommon), *Æ. rufescens* (very rare), *Calopteryx virgo* (exceedingly abundant on all the rivers and streams), *C. splendens* (ditto), *Lestes viridis* (a single specimen only of this pretty insect has been taken in the New Forest, which, however, was many years ago, and formerly adorned the famous private collection of Mr. Evans, the well-known entomologist; this species has been captured nowhere else in this country), *L. nympha* (rare), *L. sponsa* (common, but local), *L. virens* (only two specimens of this species have hitherto been taken in this country, both in the New Forest; they were formerly included in the rich cabinet of Mr. J. F. Stephens, the celebrated author), *Platycnemis pennipes* (local), *Enallagma cyastrigerium* (common), *Agrion mercuriale* (common, but very local; it is only known to occur in one other locality in this country, namely, at Epping Forest, in Essex). *A. pulchellum* (common), *A. puella* (exceedingly abundant everywhere), *Ischnura pumilio* (very rare and local), *I. elegans* (very common everywhere), *Pyrrhosoma minium* (exceedingly abundant everywhere), and *P. tenellum* (local and rare).

The neighbourhood of Christchurch is a very good one for dragon-flies, particularly on the river Avon and the river Soar, both of which abound with reeds and rushes. Heron Court, not far from hence, is the headquarters of that very rare and local species *Oxygastra Curtisii*, which is only found in two or three other localities in this country, namely, in the adjacent counties of Dorset and Devon (in addition to the New Forest, as previously mentioned). It has been captured near Heron Court on several occasions, but is always rare.

Parley Heath and Heron Common, about five miles from Christchurch, situated between the rivers Avon and Stour constitute two of the best collecting-grounds for dragon-flies in the country. They both contain a great number of ponds and clay-pits, and abound in damp spots filled with reeds and other marsh-loving plants. Here one may meet with almost as many kinds of dragon-flies as in the New Forest itself, while certain species occur in even greater numbers than in the wooded area. The very local *Libellula fulva*, which is rare in the New Forest, occurs not uncommonly on Parley Heath, but it is a very difficult species to procure, as it has the habit of keeping nearly the whole of its time out of reach, in the centre of the ponds it is pleased to frequent, and only by means of a very long net may we hope to secure it. For this purpose a bamboo fishing-rod with telescopic joints, having the topmost joint removed (as described in my "Illustrated Handbook of British Dragon-flies") would constitute the most convenient kind of handle. The beautiful variety of *Libellula fulva*, namely *fasciata*, which possesses the apices of the wings brown, also occurs in this delightful district, from whence I have two very fine female specimens in my collection.

The very rare and local *Ischnura pumilis* has been taken on Parley Heath as well as, by myself, at Bournemouth, five miles distant on the sea coast. The latter locality also is a very good one for dragon-flies, particularly round the ponds on Canford Heath, at the back of the town. This pretty common, however, is unfortunately being rapidly encroached upon for building purposes, and the habitat of many good species will consequently be destroyed in a few years hence. The local *Lestes sponsa* occurs very plentifully at Bournemouth, which town, by the bye, is a very convenient place to stop at, as all the localities mentioned above may easily be reached from it by either rail or road.

SCIENCE-GOSSIP.

A MOST valuable paper for marine zoologists appeared in the December number of the "Annals and Magazine of Natural History," entitled "Natural History Notes, from H.M. Indian Marine Survey steamer *Investigator*, Commander R. F. Hoskyn. Series II., No. 1, 'On the Results of Deep Sea Dredging during the Season 1890-91,' by J. Wood-Mason, Superintendent of the Indian Museum, etc., and A. Alcock, Surgeon I.M.S., Surgeon-Naturalist to the Survey."

WE are glad to welcome another of Mr. Dugald Bell's capital and original papers on glacial geology.

The latest issued is entitled "The Great Winter: a Chapter in Geology," and was read before the Philosophical Society of Glasgow.

WE gladly welcome the first part of the "Journal of the Institute of Jamaica," doubtless edited by the newly-appointed secretary (an old correspondent of SCIENCE-GOSSIP). Mr. T. D. Cockerell. He has not been long in getting into harness, for this number contains two original papers by him.

THE rights for the patent of Larranga's Photo-Phonograph have been abandoned by the inventor, who "gives them to the world." A pamphlet on this subject has been issued by Dr. J. Maier (London: Whitehead, Morris & Co., Fenchurch Street).

THE Norwich "Science Gossip" Club was founded by the present editor of the magazine two years before he became editor. It has endured ever since, and is now one of the strongest and healthiest of popular science clubs in England. Their present "Report" will give people a good idea of this typical social and scientific club, inasmuch as it contains capital abstracts of the papers read during the past year.

WE would draw the attention of our microscopical readers to Mr. Hesketh Walker's interesting catalogue of "Microscopic Sundries," and Specialities Laboratory, 12 Church St., Liverpool.

THE sixth number of the "Mediterranean Naturalist" (edited by Mr. J. H. Cooke) has reached us. This periodical is a real gain to natural science, as it correctly collects for us the geology, zoology, and botany of the coasts of the most interesting and most historic sea in the world.

THE Institute of Marine Engineers held a very successful conversazione in the Town Hall, on December 11th. A capital programme was issued, and one sent to us; but we would suggest that another time a better correlation of gold lettering with a different colour tone is required from a scientific society, so that people may be better able to read the programme.

WE have received from Mr. F. L. Dames, natural history and scientific bookseller, 47 Tauben Strasse, Berlin, a series of his catalogues, comprising pamphlets, books, etc., on every department of natural history, botany, zoology, geology, palæontology, mineralogy, chemistry, physics, etc. The latest issued includes 350 works on diatoms and desmids, and 250 on algology and microscopy alone.

WE cordially welcome M. Tempère's 7th, or December part of "Le Diatomiste." This will prove the best work of its kind yet issued. The illustrations are of an unusually high-class character (London: Baillière & Co.).

WE are glad to draw attention to Mr. F. V. Theobald's Part II., "Account of British Flies" (London: Elliot Stock). This will prove a most useful book for intending students of British Diptera.

A FUND is very properly being raised under the auspices of the Royal Microscopical Society, for the benefit of the widow and nine children left by the late Mr. John Mayall jun., the active, well-known, and highly esteemed secretary of the Society. Scientific men work frequently for anything but money, and this is an instance where our wealthier scientific brethren have the opportunity of being helpful.

DR. A. IRVING read an interesting and very suggestive paper at the early December Meeting of the Geologists' Association, on "Organic matter as a Geological Agent."

THE "Geological Photographs" Committee appointed by the British Association in 1889, have issued another Report, in which they state that as yet not one half of the British counties are represented in the collection. Here is a good and useful opening for our increasing army of amateur photographers.

OUR Geological readers should procure Dr. Charles Ricketts' paper (Presidential Address to the Liverpool Geological Society) on "Some Phenomena which occurred during the Glacial Epoch." No English geologist is better posted in our British glacial geology than Dr. Ricketts.

WE commend to all those interested in the subject of Technical Education (and suggest they should procure it), the Syllabus of the Nicholson Institute, Leek, Staffordshire. It is the best programme of good work we have seen published.

MR. EDWARD WILSON, the well-known and able curator of the Bristol Museum, recently published in the "Geological Magazine," a paper "On a Specimen of *Waldheimia perforata*, showing Original Colour-marking." This interesting specimen was discovered by Mr. J. W. Marshall, of Bristol, an enthusiastic collector of Jurassic Brachiopoda. We have frequently found near Castleton, Derbyshire, specimens of *Terebratula hastata*, retaining their original colour-bands.

A CAPITAL and most useful *brochure* has just been written by Mr. Edward Whimper, and published by John Murray, on "How to use the Aneroid Barometer."

THE last issue of the Guernsey Society of Natural Science and Local Research is a capital number. It contains papers on "The Correlation and Relative Ages of the Rocks of the Channel Islands," by Mr. C. G. De la Mare; an account of "A Dredging Excursion off Guernsey" (we should like above all

things to have been in it), by Mr. R. L. Spencer; "Notable Oral Equipments in Vertebrata," by Mr. Fred Rose; "The Sea Urchin," by Mr. W. Sharp; "Instinct, Reason, and Reflex Action," by the same; "The Flora of Jethon," by Mr. G. T. Derrick; "Submarine Breathing Animals," by Mr. J. Sinel; etc.

AN adaptation of the telephone to existing telegraph lines has recently been successfully completed between Grangemouth and Glasgow by Mr. A. Erskine Muirhead. The telephones used are the French type, with microphones. The line has two intermediate stations, one at Port Dundas and the other at Kirkintilloch, but this in no way impaired the speaking. It is proposed to add two other intermediate stations, making six telephones served by a single line. Though the telegraph instruments were employed simultaneously, there was no interruption, and it is intended that the telegraph instruments shall be discarded. Another feature of the adaptation is that as the wire runs along the canal, the barger can fix a portable telephone on it at any place, and speak to the termini.

WE are pleased to see that a Fourth Edition of Mr. Worsley-Benison's "Nature's Fairy-Land" is required, and was issued last week by Messrs. Elliot Stock.

THE following are the lecture arrangements made by the Royal Institution before Easter:—Professor John G. McKendrick, six Christmas lectures to juveniles, on "Life in Motion; or, the Animal Machine;" Professor Victor Horsley, "Twelve Lectures on the Structure and Functions of the Nervous System (the Brain);" Mr. A. S. Murray, "Three Lectures on Some Aspects of Greek Sculpture in Relief;" Professor E. Ray Lankester, "Three Lectures on Some Recent Biological Discoveries;" Professor W. P. Ker, three lectures on "The Progress of Romance in the Middle Ages;" Dr. B. Arthur Whitelegge, three lectures on "Epidemic Waves;" Professor J. A. Fleming, three lectures on "The Induction Coil and Transformer;" the Right Hon. Lord Rayleigh, six lectures on "Matter: at Rest and in Motion;" Professor J. F. Bridge, three lectures on "Dramatic Music, from Shakspeare to Dryden (the Play, the Masque, and the Opera)," with illustrations. The Friday evening meetings will begin on January 22nd, when a discourse will be given by the Right Hon. Lord Rayleigh on "The Composition of Water." Succeeding discourses will probably be given by Sir George Douglas, Bart., Professor Roberts-Austen, C.B., Mr. G. J. Symons, Professor Percy F. Frankland, Sir David Salomons, Bart., Professor L. C. Miall, Professor Oliver Lodge, Mr. George Du Maurier, Mr. John Evans, Mr. F. T. Piggott, Professor W. E. Ayrton, and other gentlemen.

MICROSCOPY.

CLEANING SLIDES.—Canada balsam may be cleaned from slides by moistening a rag with spirits of turpentine; if the balsam is very hard, it may be just warmed over the spirit-lamp. I find this the best way, being very quick.—*H. E. Griset.*

MOUNTING BUTTERFLIES' PROBOSCES.—Will any of your readers kindly tell me the best way to mount a butterfly's probocis? I have tried a good many in Canada balsam, but the two halves always become separated. Is it usual to mount only the one half, or is there some way of mounting it whole, without the two halves separating?—*R. H. Yapp.*

MALES OF CLADOCERA.—During the months of September, October, and November last, the comparatively rare males of the Entomostracan order Cladocera seemed to be fairly abundant in the south Epping Forest district. Males of fourteen species in all were seen by me during the period mentioned, belonging to the different genera as follows: Ceriodaphnia (4), Scapholeberis (1), Simocephalus (1), Daphnia (4), Bosmina (1), Acroperus (1), Camptocercus (1), Pleuroxus (1). I do not know whether to consider this as an exceptionally good list for one season or not, but it is certainly far better than my records for the two preceding years, and it would be interesting if collectors of pond-life in other localities would give their experience in this matter.—*D. J. Scourfield.*

NEW SLIDES.—We have received from Mr. A. Flatters, of Oldham, three most interesting and botanically useful slides. One is the transverse section of old pine-wood (*Pinus sylvestris*), cut the $\frac{1}{840}$ in.; another is a tangential transverse section of the same, cut the same thinness; and the third is the radial transverse section cut down to $\frac{1}{1000}$ in. Mr. Flatters' slides are accompanied by a very ingenious explanatory diagram.

ZOOLOGY.

THE BUTTERFLIES OF JAMAICA.—In the article on this subject in the October number, I desire to correct one or two misprints in the list of names. For *Synchlöe joppa* read *Synchtöe J.* For "(Boridv.)" read "(Boisdv.)" For *Kricogonia terina* read *K. terissa*, and for *Callydryas senuæ* read *C. sennæ.* All these belong to Jamaica; and they and their larvæ (apparently a second brood) swarmed there from May to July, as so graphically described by Dr. Plaxton. Indeed the great number of larvæ, chiefly of Noctuæ (erebidæ). and Geometræ (*e.g.* the beautiful black Melanochroia (?) with white-tipped wings) swarming sometimes in masses a foot and more wide, on the

trunks of *Pithecolobium saman*, and other of their food-supplying trees, was a more remarkable feature of the earlier months of this year in Jamaica—and is the more remarkable when considered in connection with the alleged rarity of insect-life in more temperate regions during the same period.—*Henry Strachan.*

SUPPOSED BREEDING OF THE SCOTER NEAR CHICHESTER.—Mr. Anderson's communication at p. 256 under the above heading is hardly so circumstantial and full as to place the breeding of the scoter at Earnley beyond doubt, and I hope in a matter of so much interest he will publish all the particulars in his possession. Will Mr. Anderson kindly say whether any of the seven Scoters seen were procured, their presumed age, and what reason there was to suppose they had been hatched in that neighbourhood? Mr. Anderson is of course aware that scoters may be found on the coast in every month of the year, and that they not unfrequently in summer, visit inland sheets of fresh water. I think I have evidence even stronger than that given by Mr. Anderson in favour of the probability of the scoter having nested in Norfolk in 1875, for a brood of young birds was seen on Hickling Broad throughout the summer of that year, and the late Mr. Booth saw fourteen or fifteen of these birds flying over the same Broad inwards at the end of July. I should hesitate to claim the scoter as having bred in Norfolk on this unsupported evidence, but if Mr. Anderson can show strong probability of its having done so at Earnley, I think the two cases would lend mutual support to each other.—*Thomas Southwell, Norwich.*

BLACK-VEINED WHITE BUTTERFLY.—I am glad to be able to give Mr. Waters the following information respecting the capture of this insect by a friend. In the neighbourhood of Sewerby, Hull, in May 1885, two larvæ of this butterfly were found feeding on a species of thorn. It was not known what they were until the perfect insect appeared, when a further search was immediately made and six pupæ were found in the same place, all of which emerged in the course of a day or two. Three of these are now in my possession. As many of the young trees and thorns about there were newly planted varieties from the Continent, might it not be possible that the ova or young larvæ might have been brought over into this country with them?—*C. E. Rockett.*

SHELLS WITH DOUBLE MOUTHS.—Mr. Ashford, in his interesting account of the various records of double-mouthed monstrosities of Clausiliæ, remarks that, "Judging by the absence of records, shells with large and simple mouths are not liable to such an accident." Allow me to state that in Mr. William Nelson's magnificent collection of Limnæidæ, there are a number of specimens of *Limnæa peregra* with two and three apertures; and if I remember rightly, I have also seen examples of double-mouthed *L. peregra* in the beautiful collection of Mr. J. Maddison of Birmingham.—*W. E. Collinge, St. Andrews, N.B.*

CLAUSILIA WITH TWO APERTURES.—The correspondence on this subject in recent numbers of SCIENCE-GOSSIP, induces me to put on record the occurrence of a similar monstrosity in Bedfordshire. The species is *Clausilia rugosa*, and was found at the foot of an old willow-tree, in the hamlet of Limbury, by my son Edgar. The two apertures were well formed, and similarly situated to those shown on p. 257 for 1891. The specimen was presented to Mr. Taylor of Leeds, and probably is still in the possession of that gentleman.—*James Saunders, Luton.*

BOTANY.

MOTHS AND SALLOWS.—Every entomologist knows that the male catkins of the sallow are very attractive to moths, and that the liquid which they imbibe partially stupifies them. Now, I often wondered how, the sallow being anemophilous, the plant could be in any way advantaged by the visits of insects; and why, if it is not advantaged, an attractive secretion was developed at all. It occurred to me that the insects shook the catkins and so facilitated the dispersion of pollen. But if this were the explanation, the stupifying nature of the liquid would seem a positive disadvantage, as it makes the insects remain quiet. The only explanation I can offer is, that when heavy moths become intoxicated and fall off, the elastic rebound of the stem of the catkin may shake off the pollen; but this seems very unsatisfactory, and possibly one of your readers may be able to give a better explanation.—*J. R. Holt, Dublin.*

ABNORMAL ORCHID FLOWERS.—The following abnormal orchid flowers have come under my observation during the present year. One flower of *Cattleya mossiæ* with three sepals and two petals; the superior petal was adherent to the column.* One flower of *Cattleya mendelii* with two sepals and only one petal, the lower sepal bearing rudiments of the labellum in the form of a narrow ridge running from the base of the column down the centre of the sepal and terminating in a deep purple-coloured contorted appendage. One flower of *Cypripedium Lawrencianum* in which the shield-like staminode was contorted. The labellum was larger and longer than usual, measuring exactly one inch longer than the inferior sepal. The two lateral petals were curved. The inner side of the right lateral petal was slightly lobed and inflected, bearing the markings and colours on frontal and dorsal sides exactly like the labellum, while on the outer side all the characteristics of the opposite petal were present. Two abnormal flowers of *Cypripedium*

* I am indebted to Mr. H. Sams for kindly sending me the first five specimens.

sedeni: (1.) Having a median fertile stamen occupying the normal position of the staminode. There was no median sepal. The two lateral sepals were distinct. No lateral petals were present, but a petal occupying the position of the median sepal. (2.) The corolla of this flower was composed of four petals, the lateral petals were half-curved, and the lower petals assumed the saccate form of the labellum. The two lower sepals were concrescent; the andrœcium and gynæcium were normal. The first flower affords an example of a Cypripedium in a dimerous condition, and the second an example of pleiomery or plurality of parts. Seven malformed flowers of *Phagus grandiflora*, three of which had two of their petals adhering to and forming a hood over the column. Four flowers in which the dorsal sepal was united to the column. The flowers of *Ophrys apifera* are very variable. This year I have seen several flowers in which the two pouches of the rostellum were more or less distant from each other, and I have frequently observed flowers with their pollinia differing in shape.—*J. H. A. Hicks, F.R.H.S.*

Curious Growth of Fungi.—During one of my rambles in November, through a wood near Croydon, I collected a large number of specimens of fungi; many of them exceedingly beautiful, and all full of interest to the student of natural history. In one instance a common variety which abounded among the fallen leaves of the oaks and beeches, presented a growth so curious that perhaps an account of it will interest some of your numerous readers. Three plants, belonging to a light brick-red-coloured variety of Agaric, with gills of a paler and more delicate shade, had sprung up close to one another and were connected together by their epidermis, the stems and gills of each individual being distinct and separate. There were no marks of suture at the juncture of the three caps, and the largest of the group was pulled over sideways by its smaller neighbours. These facts seem to show that the three plants came into existence in this condition, thus forming a sort of botanical Siamese triplet which I believe is very uncommon in this class of fungus. I naturally wished to preserve such a curiosity, but on examination at home I found the plants to be infested by small white, footless, black-headed maggots, the larvæ, I suppose, of a species of fly. Closer scrutiny revealed a minute puncture in each cap, by means of which the ova had been deposited by the parent-fly, in the plant that was to supply food to the larvæ when hatched, and thus an organism that is, in a sense, parasitical upon decaying vegetation, was in its turn preyed upon by another. A few days later, when walking over the downs, I disturbed a flock of rooks, which proved to have been feeding on maggots similar to those just described, for the ground was strewn with fragments of fungi pecked to pieces by them in prosecuting their search. I noticed here another curious fact with regard to fungi. Wherever the turf had been taken up and removed, the place was marked by a ring of toadstools that had sprung up along the circumference of the part bared. I was unable to discern any cause for this, but the occurrence was too marked and frequent to have been accidental.—*F. G. Bing.*

"Sporting" Clover and Rare Plants.—*Apropos* of Mr. G. H. Bryan's note in your issue of this month, it may perhaps not be without interest to record that I also found the proliferous state of *Trifolium repens* on the bank of the Midland Railway, near Mill Hill, N.W., this summer, and not far from it a similarly monstrous form of *Plantago major*. Close to these, and evidently introduced in ballast, I found what an eminent botanical authority stigmatised, when I showed them to him, as "a bad lot" viz: *Bartsia incana*, *Camelina sativa*, *Anthemis tinctoria*, a Potentilla (I think, hirta), and a Dracocephalum. These five were all growing within the space of one square yard. *Bartsia incana* I subsequently found again in abundance on the Great Northern Railway near Finchley, in company with a blue labiate, which I have not been able to identify. On the Midland line near Hendon, I found a solitary plant of *Erysimum orientale*, whilst *Nasturtium sylvestre* was growing in abundance beside the Great Northern near Highgate. *Ranunculus lingua* still grows in the Totteridge ponds, and though *Teucrium botrys* has for the last few years been extinct at its former station near Mill Hill, *Polygonum officinale* (or *multiflorus?*) still exists in the neighbourhood, but is so persistently eaten down by cattle before it has time to flower that its identification is difficult. I may add that I found a very fine albino bloom of *Centaurea scabiosa* in September, at Cromer, while taking a fine haul of the larva of the privet hawk-moth, which always seems most abundant by the sea. If you think these notes of any interest, pray make what use you like of them. —*A. E. Hudson.*

NOTES AND QUERIES.

Colouring of Flowers.—While the white-flower question is being noticed by the many botanical and other readers of Science-Gossip, I will mention a few which I think will be useful to its long list of notices. Plants of *Campanula rotundifolia* I have several times found quite colourless, or, on the other hand, coloured to excess "blue purple." *Orchis pyramidalis* is often very variable in colouring; on a hedge-bank in Kent I saw a large cluster of these plants, perhaps fifty, amongst them was a pair with light cream-coloured flowers; others of the same group were of a deep rose-purple or madder colour. Of *Gentiana amarella*, an albino specimen sent to me by Mr. A. Pickard, of Wolsingham; this is the first "albino" of this plant I have seen, although I saw a great many of them normally coloured in Kent and Surrey this year. Of *Gentiana campestris* I found five colourless specimens growing in a group on Box

Hill. Specimens of *Scabiosa succisa* may be found of shades from white to purple; and *Scabiosa columbaria* from white to dark blue, but the latter very rare. It may be noticed, at least in many cases, that the want of colour is usually due to the exclusion of light and poorness of soil, while the excess of colouring (as the purple Pyramidal Orchis just mentioned) is caused by excess of light and nourishment; but this does not account for the cream-coloured form in the same situation: plants having been placed in an air-tight bottle, and kept in the dark for a few days, will, as a rule, lose more or less their colouring. While speaking of abnormalities, I may mention some plants of *Geranium molle;* they were all above a yard long, and bore double flowers (November 14) of half to an inch in diameter, with from fifteen to thirty parts of all the whorls.—*Henry E. Griset.*

TOAD-SPAWN.—On August 1st, while visiting some small ponds, which had been dried up for some weeks, I found some spawn similar to that of the toad, but as I never knew toads to spawn there, and the ponds were a great resort of natterjacks, I suppose it was their spawn. Can you account for their late spawning?

EDWARDS' "REPTILES."—Can any reader tell me if I could procure a copy of the paper which Thomas Edwards wrote upon the "Reptiles of Banffshire," and also what preparation is used to prevent the skins of such reptiles as frogs, newts, etc., from shrinking when bottled.—*M. A. Smith.*

THE SOLAR YEAR.—The Solar Year consisting of 365 days 6 hrs. 9 min. 9·6 sec., and the 6 hrs. being accounted for by leap-year, I shall feel much obliged if any one could inform me how the remaining 9 min. 9·6 secs. are allowed for; whether in 1900 A.D. an extra day will be inserted in the calendar.—*T. R. Jones.*

LATE SWIFTS.—On the 13th last November, I saw a swift. Had it been a swallow or martin I should scarcely have deemed it of sufficient interest to send to your paper, but that it was a swift I am quite sure, as it crossed the road I was on three or four times, flying low down; once being chased by one of our small native birds. This year I saw several in the early part of September.—*Chas. Law.*

ANIMATED OATS.—My cousin having sent me some of these oats, I followed out her instructions by dipping one in some cold water and then lightly throwing it on a piece of paper. In a few seconds the awns began to move, and after some struggling the oat lifted itself up and turned over. After it had performed many gyrations the oat again became inanimate. I should be greatly obliged if some reader of SCIENCE-GOSSIP, could explain the cause of these movements.—*Clara Kingsford, Canterbury.*

THE PLAGUE OF FLIES.—Whilst botanizing in woods during last summer and autumn, I was on several occasions almost driven mad by the constant attack of flies and other insects, and although I endeavoured to ward off the same and keep them at a respectful distance by smoking and sprinkling my hat and clothes with camphor or carbolic, I found that my rude remedies were quite unsuccessful. Thinking that some of your esteemed contributors could suggest an efficient remedy for this plague, I have ventured to ask your kind assistance, not only for myself, but many others who have suffered in the same way.—*C. Rea.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

TO ANONYMOUS QUERISTS.—We must adhere to our rule of not noticing queries which do not bear the writers' names.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply DISGUISED ADVERTISEMENTS, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges," which cannot be tolerated.

WE request that all exchanges may be signed with name (or initials) and full address at the end.

SPECIAL NOTE.—There is a tendency on the part of some exchangers to send more than one per month. We only allow this in the case of writers of papers.

TO OUR RECENT EXCHANGERS.—We are willing to be helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

A. E. BOYCOTT.—We shall be very pleased to have your paper for SCIENCE-GOSSIP.

J. A. W.—See Dr. Taylor's book on "Our Common British Fossils," for descriptions and illustrations of the crag shells found in the Walton-on-Naze cliffs.

J. H. B. GREEN.—Many thanks for the unusually large and fine specimen of abnormal growth of cabbage-leaf. It well illustrates the origin of Pitcher plants. See the papers on "Vegetable Teratology," in SCIENCE-GOSSIP vol. for 1890.

F. G. BING.—Many thanks for your pretty sketch of the three funguses growing together by their caps.

J. E. K.—Apply to Messrs. Wesley & Son, or Messrs. Dulau, for works on Natural History, &c., of Brazil.

H. W. BISHOP.—You can procure a simple section-cutting machine from any dealer in microscopic materials.

A. W. RICHARDSON.—Coloured plates were only issued with SCIENCE-GOSSIP during 1884 and 1885.

ALFRED TARNER.—Get Mr. English's (of Epping) little book on how to preserve fungi. Mr. Maynard, of Saffron Walden, prepares them beautifully.

H. E. CRAVEN.—The only mineral resembling iron-ore (specular iron) in the very small specimen sent, is the dark transversely striated mineral "Black Jack," or zincic sulphide.

"HUSSAR."—Get the "Collector's Handbook," published by W. H. Allen & Co. There is no little book on marine life correspnding to Cook's Ponds and Ditches." Pennington's "Zoophytes," and Dr. Landsborough's ditto are good.

JOSEPH SMITH.—See chapters on "Sponges," by Professor Sollas, in 1884 vol. of SCIENCE-GOSSIP; also on "Shore Collecting," in SCIENCE-GOSSIP vol. for 1888. All the works on the subject are expensive.

EXCHANGES.

GEOLOGICAL works by Geikie, Woodward, Dawson, Green, &c., wanted, in exchange for foraminifera named and mounted, or for foraminiferal material.—J. H. C., Highland House, St. Julian's, Malta.

TERTIARY fossils. Wanted, tertiary fossils, named and located, in exchange for Mediterranean shells, lepidoptera, &c. State desiderata.—J. H. C., Highland House, St. Julian's, Malta.

HUMBOLDT'S "Kosmos," 2 vols., 1845–48, cloth gilt, scarcely soiled. Offers.—Joseph Wallis, Deal.

WANTED, fertile eggs of vapourer moth (*Orgyia antiqua*), in exchange for eggs of gipsy moth. Address—A. Witt, Hale Parsonage, Salisbury.

I SHALL be glad of any named British shells to start a collection. Can offer a few species of British lepidoptera.—Miss E. M. Pepperell, 5 Park Street, Bristol.

SCIENCE-GOSSIP wanted, cheap (Nos. 241–288, both inclusive), to complete set. State lowest price.—H. J. Barber, Brighouse, Yorkshire.

WANTED, good micro. slides up to the value of 4*l.*, in exchange for an aquarium 24 × 12 × 12 inches, glass slides.—W. Davis, 48 Richmond Road, Cardiff.

A fine gathering of *Batracheosperma moniliforma*, suitable for mounting, in exchange for good slides, preferably of marine hydrozoas and polyzoas.—J. E. Lord, Rawtenstall.

EGGS to exchange for others not in collection: sheldrake, spoonbill, red grouse, quail, woodchat, shrike, common shrike,

ring-ousel, red-legged partridge, Arctic tern, black-headed bunting, black guillemot, kittiewake, herring gull, and coote.—K. H. Jones, St. Bride's Rectory, Manchester.

ELECTRICAL.—Frictional and galvanic apparatus, good as new. Will exchange for good magic-lantern and part cash, or offers.—G., 35 Caversham Road, N.W.

A GOOD collection of British and foreign land, freshwater, and marine shells, consisting of over three hundred species, and many varieties, including fifty lots of shells, neatly mounted, in glass tubes. For full particulars apply to—P. R. Shaw, 48 Bidston Road, Birkenhead.

TATE'S "Land and Freshwater Molluscs," coloured plates, clean copy, good as new. What offers—geological? Also SCIENCE-GOSSIP for 1886, unbound.—G. H. Corbett, 13 Church Road, Nechells, Birmingham.

DESIDERATA. — *Testacella haliotidea, maugei; Zonites glaber, radiatulus, excavatus, purus, fulvus; Helix aspersa* var. *exalbida, arbustorum* var. *flavescens, sericea, fusca, virgata,* var. *nigrescens, tessellata, ericetorum* var. *instabilis, pygmæa; Clausilia laminata, Acme lineata.* Oblata.—*H. rufescens* var. *alba, rubens,* and *minor, hispida, concinna, revelata, pisana, virgata,* and vars. *major, minor, albicans, rufula, lutescens, submaritima, alba, caperata,* and vars. *obliterata, alba, fulva, ornata, ericetorum,* and vars. *lutescens, leucozona, major, minor, rotundata, rupestris, lapicida; Bulimus obscurus, Pupa secale, umbilicata, marginata; Balea perversa, Clausilia rugosa,* and var. *tumidula, dubia, Cyclostoma elegans.*—S., 40 Braybrooke Road. Hastings.

WANTED, back numbers of SCIENCE-GOSSIP for 1866, 1868–1871, 1873, 1879, 1882–1884, in exchange for micro. slides or cash. Also, would like to exchange a few slides for others.—F. S. Morton, 158 Cumberland Street, Portland, Maine, U.S.A.

WANTED, freshwater, sea shells, and corals, in exchange for chalk polyzoa, flustra, lituola, rotalia, serpula, spicules, geodes (flint), crystals of selenite from London clay.—W. Gamble, 2 West Street, New Brompton, Kent.

Helix vittata (?) large, and far flatter than type; *H. tranquebarica, Velosita cyprinoides, Neritina orialanensis, Nassa Jacksoniana* and *Tympanotomus fluviatilis,* from Travancore; also various marine shells from Cape Comorin (unnamed), for foreign helices.—Rev. J. W. Horsley, Woolwich.

HERBARIUM. — Offered, British, Norwegian, and North American plants, for those of other countries. Printed list of duplicates.—H. Fisher, 26 Stodman Street, Newark, Notts.

SCIENCE-GOSSIP (unbound), for 1867, 1887–89. What offers in foreign postage-stamps for same?—W. Harris, 136 Drayton Park, Highbury, London, N.

WANTED, back numbers of SCIENCE-GOSSIP, "Zoologist," "Naturalist," "Naturalist's Gazette," and "Field Club"; bound vols. preferred. Will exchange books, eggs, &c. Also wanted, works by Hewitson and Morris.—W. R. Riley, Savile Lea, Halifax, Yorks.

FOREIGN land and marine shells, offered in exchange for orchids or foreign birds. — Miss Linter, Arragon Close, Twickenham.

EXCHANGE.—Fine *Lingula scotica,* lower carboniferous, in ironstone nodule; photo free. Photographic books or offers to value of 50*s*.—W. J. Heslop, West View, Lemington, Newcastle.

EXCHANGE.—Side-blown eggs of capercaillie, sociable plover, Canada goose, ring-ousel, eider duck, ptarmigan, twite, gold-crest, teal, Manx sherewater, &c. Desiderata, other eggs or insects.—J. Ellison, Steeton, Keighley.

EXCHANGE fine series of crag fossils for eggs, insects, or offers.—J. Ellison, Steeton, Keighley.

WANTED, micro. slides showing organs of generation in thallophytes, and sections of seeds. Will give good botanical slides. Address—T. B., Conservative Club, Hinckley.

WANTED, to correspond with collectors who may have rare British shells to offer in return for other very rare British shells. Mutual exchanges.—Thomas E. Sclater, Strand, Teignmouth.

WANTED, a few specimens of the following: labradorite, crocodolite (from the Congo), and any other good bright crystal minerals, about two or three inches in size and upwards, in exchange for British shells, micro. objects, fossils, polished madrepores.—A. J. R. Sclater, M.C.S., Natural History Stores, 43 Northumberland Place, The Strand, Teignmouth.

WANTED, British mammals, alive or in the flesh (fresh killed), particularly bats, mice, shrews, voles, wild cat, pine and beech marten, badger, otter; also varieties of mole, hedgehog, &c.; must be in good condition for stuffing. Apply to—W. Harcourt Bath, Ladywood, Birmingham.

SCIENCE-GOSSIP, Nos. 241–264, having four numbers missing, and a deal cabinet containing about one hundred British wild bird and gull eggs, in exchange for curios.—G. Waters, 21 Westbourne Park Road, Bayswater, W.

WHAT offer for a splendid collection of *Helix nemoralis,* including eight named vars., and forty variously banded, nearly all named: also ten various *H. arbustorum,* including var. *alba.*—H. Blaby, Brackley, Northants.

TERTIARY and cretaceous fossils wanted. Sends lists to—J. A. Ellis, 1 Pomona Place, Fulham, London, S.W.

OFFERED, Ramsbotham's "Obstetric Surgery" (published at 22*s*.), Nicholson's "Zoology" (7*s*. 6*d*.), Orme's "Heat" (3*s*. 6*d*.), Cleland's "Animal Physiology" (2*s*. 6*d*.), Saarner's "The Microscope." Wanted, good minerals and fossils.—W. H. Olver, 2 Adelaide Terrace, Truro.

To naturalists in India. Wanted, pupæ or ovæ of wild silk moths: *A. atlas, A. selene, A. cynthia, A. mylitta, C. trifenestrata,* &c. Will give cash or full exchange, as desired. Correspondence invited.—Mark L. Sykes, F.R.M.S., 31 Derby Street, Moss Side, Manchester.

OFFERED, British land, freshwater, and marine shells for others, or offers. — A. H. Shepherd, 81 Corinne Road, London, N.

EOCENE fossils for exchange, named and localised, also Cornish rock and mineral specimens. Wanted, named specimens of minerals, micro. rock sections, or perfect terebratulæ from any formations, or offers.—E. H. V. Davies, 46 Upper Belgrave Road, Clifton, Bristol.

WANTED, fossils from various localities, especially British and foreign tertiaries.—Thomas W. Reader, 171 Hemingford Road, London, N.

I WISH to dispose of thirty 8 × 6 photographs of locomotive engines (cost 2*s*. each), for which I will take offers in exchange. Wanted, a microscope, clarionet, violin, safety, or other useful thing.—Reginald E. M. Bleasdall, Dale End, Birmingham.

VOL. 41 of "Nature," clean, unbound, in exchange for anything entomological.—W. S. Rolfe, Hazeldene, Tooting Junction, S.W.

DUPLICATES.—Fine stuffed specimen of cormorant in first-class preservation, from the Isle of Wight, also *P. ovale, L. stagnalis, L. glabra, S. elegans, H. arbustorum, H. cantiana, H. rufescens, H. pisana,* and var. *alba, H. virgata,* and var. *albicans, H. caperata, H. ericetorum, H. rotundata, B. acutus, B. obscurus, P. umbillicata, C. rugosa, C. lubrica, C. elegans,* &c. Desiderata, many varieties of common species and offers, birds' eggs, or British butterflies and moths.—W. Hewett, 12 Howard Street, York.

OFFERED, *Pis. amnicum, Pal. vivipara, Byth. tentaculata, Plan. carinatus, H. nemoralis, H. hortensis, H. arbustorum, Bul. obscurus, Vert. pygmæa, Coch. tridens,* in exchange for British land and freshwater shells not in collection; also for foreign shells. Foreign correspondence invited.—H. E. Craven, Matlock Bridge.

FOR exchange, *P. contecta, V. piscinalis, V. cristata, Lim. glabra, L. truncatula, L. palustris, P. spirorbis, P. glaber, P. dilatatus, S. putris, H. sericea, C. tridens, C. minimum.* Wanted, *Pis. nitidum, Z. excavatus, H. cartusiana, Cl. biplicata,* &c.—F. C. Long, 32 Woodbine Road, Burnley, Lancs.

WANTED, *B. montanus, P. nitidum, P. roseum, A. lineata,* Offered, *P. secale, Gonisbasis plicifera, Neritina pupa, H. strigella, H. umbrosa, H. obvia, Cl. papillifera, Cl. itala, Pupa avenacea, Cl. parvula.*—G. H. Gude, 5 Giesbach Road, Upper Holloway.

A SPLENDID series of nearly fifty animal hairs, in return for six well-mounted micro. slides.—Arthur H. Williams, Hythe.

WANTED, Turton's "Manual of the Land and Freshwater Shells of the British Islands," Gray's Ed. of 1857; Reeve's "Land and Freshwater Molluscs," 1863; and Tate's "Land and Freshwater Molluscs," 1866.—H. W. Kew, 5 Giesbach Road, Upper Holloway, N.

BOOKS, ETC., RECEIVED FOR NOTICE.

"Delagoa Bay: Its Natives and Natural History," by Rose Monteiro (London: Philip & Son).—"Annals of British Geology," 1890," by J. F. Blake (London: Dulau & Co.).—"Larranga's Photo-Phonograph," by Julius Maier.—"Report of Norwich Science-Gossip Club, 1890."—"Journal of the Institute of Jamaica."—"Proceedings of the Geologists' Association."—"The Essex Naturalist."—Wesley's "Nat. Hist. and Scientific Book Circular."—"American Microscopical Journal."—"American Naturalist."—"Canadian Entomologist."—"The Naturalist."—"The Botanical Gazette."—"The Gentleman's Magazine." — "The Midland Naturalist." — "Feuilles des Jeunes Naturalistes."—"The Microscope."—"Nature Notes," &c., &c.

COMMUNICATIONS RECEIVED UP TO THE 12TH ULT. FROM: A. H. S.—J. W. S.—H. G. W. A.—J. R. H.—E. W.—H. S.—T. L.—J. H. C.—O. W. J.—A. E. B.—W. J. P.—R. H. Y.—J. H. A. H.—G. H. W.—J. A. E.—J. E. L.—H. E. G.—F. S. M.—F. V. T.—W. D.—C. K.—A. G. F.—H. I. B.—T. S.—E. M. P.—C. L. S.—C. J. L.—G. H. C.—J. A.—P. R. S.—R. H. T—F. L. J.—F. L. D.—W. G.—T. R. J.—R. B.—E. H. V. D.—C. E. R.—W. H.—T. W. R.—A. E. H.—W. S. R.—T. S.—A. F.—H. E. C.—J. E. K.—E. P.—J. W. H.—H. F.—W. H.—W. E. C.—A. H. S.—J. A. E.—G. K. G.—F. C. L.—J. H. B. G.—M. L. S—W. H. O.—H. B.—G. W.—G. L. R.—W. H. B.—D. J. S.—A. J. R. S.—T. E. S.—F. G. B.—W. R. R.—A. H. S.—C. P.—C. R.—W. P. H. T. S. B.—J. E.—T. S.—F. E. H.—P. F. T.—C. D. S.—J. A. R.—T. S. M.—J. H. C.—J. A. S.—A. H. P. W.—A. J. S.—J. W. F,—H. W. K.—Dr. A. M. C.—&c., &c.

THE POSSIBLE COAL-FIELDS OF EAST ANGLIA.

A RECENT lecture by Dr. Taylor, the editor of SCIENCE-GOSSIP, is reported as follows, in the "East Anglian Daily Times." The lecture was delivered at the Athenæum, Bury St. Edmunds. The Right Hon. Earl Cadogan, K.G., occupied the chair, and there was a large attendance.

The noble Chairman in introducing Dr. Taylor, said the subject which that gentleman had chosen for his lecture was of the greatest possible interest to all who dwell in the Eastern Counties.

Dr. Taylor opened his lecture by referring to the numerous mistakes made by people who knew nothing of the matter, concerning the probable occurrence of coal in East Anglia. He had seen in the newspapers letters stating that coal had been discovered in various well-borings throughout the county, but this simply meant that an occasional pebble of coal had been found in the drift beds among thousands of other pebbles which had been brought down and strown about by glacial agencies. It was easy to understand that from places in the Midland and Northern counties, where the coal cropped out, fragments were brought down to this district by the moving sheet of ice which at one time covered the Eastern counties. But these incidental findings of coal had nothing to do with the great argument he had to lay before them that evening, and he asked them, in the first place, to disabuse their minds of any such idea.*

What he wanted to ask them was, to imagine—and science had to appeal largely to the imagination—what the appearance of the Eastern counties would be if they could strip off, like the clothes from a bed, all the overlying strata, including the chalk. He did not hesitate to say that, if they did so, they would find a continuation of the same primary rocks extending underneath London and into the South-Eastern counties as those which occupied the surface in North Wales, Lancashire, Cheshire, and Yorkshire, only perhaps in a more or less parallel series of folds, running nearly west and east. On the ridges of these the lower Primary rocks would be found, and in the hollows of the folds, perhaps, coal-basins. It was with this fact that his lecture would have to deal. It could not be a so-called popular lecture, therefore, but must of necessity be more or less scientific, and the issues involved in it were so important to the Eastern counties that he did not hesitate to place these scientific arguments before them in as clear and lucid a manner as he was capable of. [It may be said here that the lecturer was largely assisted by specially-made diagrams, covering the walls, as well as blackboard sketches, which enabled his hearers the more clearly to follow his closely-reasoned line of argument.]

The first point to be established was that between the Somersetshire coal-field and possibly the South Welsh coal-fields in the west, and the coal-fields of Northern France and Belgium to the east, there was an underground continuation. The rocks were tied on, so to speak, from one end to the other, only they were like a chain which had been bellied down in the middle during the secondary period of geology, covered by the sea to a great depth, and strown over

* [Since the above lecture was delivered I had recently-found specimens of "coal" sent me from well-borings passed through the boulder clay. They were not coal at all, but fragments of black Kimmeridge shale.—ED. S.-G.].

with the deposits of that particular age. On the south there were thick strata of Oolitic formations, which in the famous Sussex Wealden boring were found to be nearly 2,000 feet in thickness. At Dover they were 600 feet thick, but there they had bored through the chalk, through this underlying 600 feet thick of oolite, and had struck the Carboniferous rocks. Five different seams of coal had been pierced, he believed, so that a shaft was following the boring at the present time, and before long there would be a Dover Coal-Field added to those already existing in England.

By means of a sketch on the blackboard, Dr. Taylor showed that this easterly and westerly extension—that is to say, between the west in England and the east in Belgium and Northern France—was an anticlinal axis or series of axes, along whose flanks different rocks of the primary period rested upon each other in such a way that if they could be moved to their relative positions, those furthest away from the main ridge would be uppermost and latest formed, while those close to the centre of the run of the axis would be the oldest. Therefore, he contended, it was along the outer flanks of this main axis that the coal-beds would be found, if anywhere. These flanks had themselves been much contorted, so that the coal would be in the form of narrow basins of no great width, although of considerable length, running along the trend of the underground primary ridge. For instance in Somersetshire, the basins from which coal was at present worked were very narrow in comparison with their length. The Liège Coal-Field in Belgium was not more than eight miles wide although it was 45 miles long. At Charleroi the coal-field was eight miles broad and 35 miles long. Narrow as they were, however, these coal-fields were rich in seams. At Liège 35 different seams had been discovered; in Westphalia 117; and in all of the basins he had mentioned coal was worked abundantly and profitably, although at a great depth. It had been thought by geologists in former years that it would be impracticable to work for coal underneath the chalk. The first intimation that this was not necessarily the case was given by a deep artesian well-boring near Calais, some years ago, in which the primary rocks were struck just beneath the chalk, all the other secondary strata being more or less absent. The Valenciennes Coal-Field, which was only 30 miles away from Calais, was now being very largely worked beneath the chalk, and this gave encouragement to him (Dr. Taylor) many years ago to believe that similar conditions might prevail immediately under the chalk and tertiary strata in the Eastern counties.

The lecturer then directed attention to an artesian well-boring made at Harwich in 1859, by Mr. Peter Bruff, of Ipswich. That well had a depth of less than 1,200 feet, but the Lower Carboniferous Rocks were struck and penetrated to a depth of 70 feet. He pointed out, however, that these were not the real coal-bearing rocks, and that every foot deeper they went down at Harwich might take them further away from the proper position where the coal-bearing strata would be found, unless the strata were inverted, as was the case in some parts of the Belgium coal-field. The latter had doubtless been peeled off by denudation during the period when the rocks were exposed to atmospherical wear and tear, and were depressed to become the bottom of the cretaceous sea. The one important fact to geologists in connection with the Harwich well-boring was that none other of the secondary formations were present beneath the chalk, but that the chalk went bang down upon the old floor of primary rocks. Reasoning on this point, and believing that to the north the upper coal-measures—the higher coal-measures, that was to say—would be found in successive order resting upon the flanks of the Harwich carboniferous foundation, he had thought that trial borings to the south of Suffolk, and possibly to the north in Essex, might penetrate some of the upper measure containing the crumbled, narrow, and elongated coal-fields he had referred to. A few years ago at Combs, near Stowmarket, the chalk was pierced in a deep well at a considerably less depth than had been anticipated—a little under 900 feet; but unfortunately the boring-tool did not proceed any further, so geologists were left in darkness as to what remained underneath. The primary rocks in Suffolk had never really been bottomed until a few months ago, when at Culford, five miles from Bury St. Edmunds, in an artesian well-boring upon Lord Cadogan's estate, the chalk and the few beds of underlying cretaceous strata were passed through, and what were now believed to be the primary rocks were reached. These had only been pierced, however, for a distance of a few feet, and none of the characteristic fossils of the carboniferous formation had been brought up. Instead of that, the process of boring had somehow or another carried down, from the lower cretaceous beds, into the soft shales of the primary rocks beneath, some of the lower greensand microscopic fossils. The gault was represented by a comparatively hard bed, and a fragment of an ammonite had been brought up which resembled a liassic species. It was thought by geologists, however, to be very unlikely that the lias strata should occur at such a high level without any trace of the oolitic rocks above, and the conclusion had been arrived at, therefore, that the occurrence of this fossil there in a fragmentary state must have been as a derivative one. The bottom rocks at Culford, near Bury St. Edmunds, the seat of Earl Cadogan, were believed by Mr. A. Jukes-Brown, Mr. Whitaker, Mr. Holmes, and others, to be primary; and Dr. Taylor expressed his conviction from the microscopical examination he had made of a few fragments, that they were from the lower coal-measures of the carbonifer-

ous formation. However, he hoped Earl Cadogan would come to the aid of scientific men, and allow the boring to proceed another hundred feet into these interesting Primary rocks. They must remember that this was the first time the underlying Primary floor had been bottomed in Suffolk, and that a boring through these soft carboniferous shales might be of practical benefit even if coal were not found. He had submitted specimens of these soft shales to analysis by Mr. J. Napier, of the Museum Laboratory, and, as he (the lecturer) anticipated, they were found to contain strong traces of petroleum. It would not be a bad thing if a deep boring through these soft shales yielded petroleum instead of coal.

What he should like to see was trial-borings a little further to the north of Culford. Taking a line from Southwold through Eye to Mildenhall, he thought that would be the best district along which to make such efforts to reach the upper coal-measures which probably lay synclinally along the northern flanks of these underground primary rocks. He had much faith in the districts of Brandon, Lakenheath, and Mildenhall, because the Memoir of the Geological Survey, so carefully mapped and measured by Mr. Woodward, showed that the oolitic rocks thinned out in that direction, and that very deep borings would not be required, therefore, in order to reach the primary rocks beneath. The most remarkable thing to geologists was, that at Culford these oolitic beds were absent. The thinnest set of the overlying beds had been previously bored through at Ware, in Hertfordshire, at a depth of 800 feet, but at Culford the depth was only 650 feet. What they wanted, therefore, in the future, with regard to experiments in search of coal, was to institute a set of borings somewhere in the region he had just mentioned. He should prefer the waste lands about Mildenhall, which now grew nothing but peasants and pheasants, as the site, for if coal could be found there, it would save the sylvan lanes of Suffolk from a destruction, which, however much he valued the importance of coal, he should be sorry to see brought about.

In conclusion, Dr. Taylor said they must remember that at present this inquiry was in the scientific stage. In any undertakings that might be made for the discovery of coal, he wished it to be distinctly understood that they were scientific experiments. He thought that some might prove successful, but he should be very sorry to have it go forth that the enterprise was as yet, in a purely commercial stage. He had been writing on this subject for nearly twenty years past. Hitherto, he had piped and nobody had danced: now, there was a tendency to dance too much. Nevertheless, without public support and public spirit, this important inquiry could never be carried on, and he appealed to all patriotic residents in East Anglia for assistance towards a solution of the problem. He was delighted that that night he had been honoured with the presence of a wealthy and enterprising English nobleman, known and honoured by the English people, and he would venture to ask his powerful aid and influence towards the decision of a question, upon which science was bringing to bear the weight of logical facts. In the opinion of the people of East Anglia no current subject was of greater importance than the one he had been privileged to lecture upon that night, and remembering how coal had been discovered under similar conditions in France and Belgium, as well as at Dover, he thought that residents in this part of the country could not sit contented with their hands in their laps, without allowing some trial-borings to be made in the manner he had suggested.

The lecture occupied an hour.

At the close, Earl Cadogan, in proposing a vote of thanks to the lecturer, spoke of the eloquent and very interesting manner in which Dr. Taylor had dealt with a subject, which might otherwise had been considered dry, and as President he felt that he might become the interpreter of the audience in thanking Dr. Taylor. He (Earl Cadogan) had never heard the theories and facts of so abstruse and scientific a subject treated in a more interesting manner. Dr. Taylor had made certain points as to strata perfectly clear to his audience. Earl Cadogan said he had specimens of the various strata, through which there had been boring at Culford, sent to eminent geologists. He gathered from Dr. Taylor's lecture that the chances of finding coal in the neighbourhood of Culford were somewhat remote, but understood that petroleum might possibly be found beneath his estate. Such a subterranean arrangement was a contingency which hitherto had not presented itself to his mind. He understood from Dr. Taylor's remarks that it was desirable to prosecute boring researches further. Mineral wealth was of the utmost importance in a district like that of East Anglia. If coal was discovered in the Eastern counties, undoubtedly the wealth of the residents would be much increased, and the prosperity of the kingdom enhanced. He should be glad if such a prospect could be foreshadowed, and might add that although he could not undertake to incur very great expense, yet possibly the boring would be continued some distance further. It was highly desirable a subject so full of interest and instruction should be continued some extent further. If Dr. Taylor's well-considered lecture proved instrumental in enlightening the inhabitants of the Eastern counties in the direction indicated, he thought all present would agree that a very agreeable and profitable evening would have been spent.

A hearty vote of thanks having been accorded to Dr. Taylor by acclamation, in acknowledging the compliment, he expressed his pleasure in hearing that Earl Cadogan would permit the boring at Culford to be extended 50 to 60 feet further for the benefit of science.

ROSSENDALE RHIZOPODS.

No 8.

IN our previous papers we have treated upon the Rhizopods belonging to the order Protoplasta, which is divided into two sub-orders, Lobosa and Filosa; in the present article we arrive at the order Heliozoa. This contains nine genera, and sixteen or more species. The Rhizopods of this order differ widely, in many important particulars, from those of the previous one. Some of them are very beautiful, from the presence of chlorophyll as a permanent constituent of their bodies; others are, perhaps, more curious than beautiful; while a considerable number are very obscure, and in some cases offer considerable difficulty to a successful identification. The animals of this order are essentially swimmers, and are most commonly found among Algæ and duckweed. They consist generally of a more or less spherical mass of naked, foamy protoplasm.

In one genus, Clathrulina, there is a beautiful

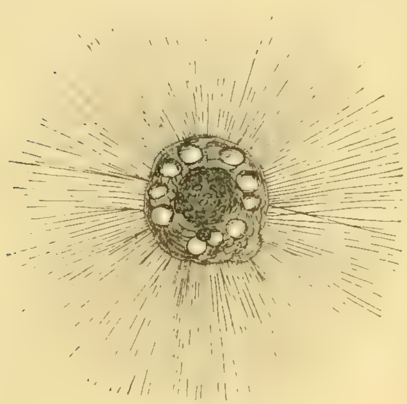

Fig. 12.—*Actinophrys sol.*

latticed, globular, stalked, silicious test. In Vampyrella, the spherical body can assume ameboid forms, and in addition to the ordinary pseudopodial rays, there are others which are Acineta-like, and the periphery of the body can be thrown into conical and lobose extensions. The species of Diplophrys are mostly minute, and generally associated together in numbers, each having fine pseudopodia radiating from its opposite poles, and an interior coloured (amber or red) spot.

Acanthocystis has many both curious and beautiful species, which are characterised by the body being invested by a layer of protoplasm densely crowded with minute linear particles, and by the presence of simple, pin-like, or furcate silicious radiating spines. In Raphidiophrys there is also an exterior layer of protoplasm extending in tapering processes on to the pseudopodial rays, and densely pervaded with minute spicules tangentially arranged; the Rhizopods of this genus are generally compound, being found in groups of variable numbers joined by isthmus-like bars. The genus Heterophrys is Actinophrys-like, but the body is invested with a layer of granular protoplasm, having a villous surface. In Hyalolampe, the protoplasmic body is covered with a layer of minute, colourless, silicious globules. Although I have seen several species belonging to at least three of the above genera, it is quite evident that they are somewhat rare forms in this district, and as in the instances mentioned I was unable to devote time to their study, I do not propose in these articles to describe any of the above genera, confining my notes to the two genera, Actinophrys and Actinospherium. I think it probable that the Rhizopods of the order under consideration are southern forms, delighting in the genial warmth of a less rigorous climate than that of Rossendale. I know that, with the exceptions to be stated presently, none of my microscopical friends have been more fortunate than myself in the collection of the Heliozoa; while, on the other hand, I have frequently come across them in tubes of the Rotifera sent me by kind correspondents from various parts of the Midland counties and the south of England. *Actinophrys sol*,* or, as the older microscopists termed it, "The Sun Animalcule," appears to be as common here as elsewhere, being found in all our waters, particularly those well supplied with duckweed and other aquatic plants. Few possessors of microscopes, I should imagine, have not frequently had this Heliozoan Rhizopod under observation. It presents itself generally as a colourless, globular, more or less cellular-looking body, covered with long, delicate, hair-like rays. As it placidly floats in the water, it seems entirely unfitted to cope with its more active neighbours; but observation proves it to be able to look well after its commissariat. Although it is to some extent at the mercy of the slightest current, it is able to anchor itself to some stationary or floating object. It is a somewhat sluggish, and apparently a stationary animal, but if carefully watched it will be noticed to slowly glide along by some obscure movements of its pseudopodial rays. The body, as stated above, is generally colourless, but coloured food-balls, red, green, or brown, may sometimes be observed embedded in some part of its substance; these, after digestion has continued some time, appear as coloured, cloudy patches. The body is granular, and seems in some individuals so vesicular as to present the appearance of cellular tissue, though not often as definitely so as in Actinospherium. The pseudopodia are very numerous, but variable in different specimens; they are as long, or even twice as long, as the diameter of the body, and are very delicate, and capable of retraction.

* The vesicles in the figure of *A. sol* ought to have been shaded.

The animal multiplies by division, and may occasionally be observed in various stages of the process. Its food consists of Rotifera, Infusoria, and Microscopic Algæ. When one of the Rotifera, or other active animal, swims against the pseudopodial rays, they lay hold of the object, and if successful in retaining it, contract to the surface of the body, drawing down the prey with them, which is then surrounded by a portion of the body protoplasm, after which the mass is drawn in. There is a large central nucleus, generally indistinct, and a large bubble-like contracting vesicle, situated at the periphery of the body. Size variable, my specimen from $\frac{1}{300}$ to $\frac{1}{500}$ of an inch in diameter of body. *Actinophrys picta*, the only other species, closely resembles *A. sol*, differing only in the colourless granular protoplasm having numerous green chlorophyll granules scattered through its substance. I have found only one or two specimens of this species, and it requires no further description for its identification. I now come to the last of the Heliozoas for which I can fairly claim a Rossendale habitat.

Actinosphærium Eichhornii was formerly placed in the previous genus, but was eventually separated on account of important differences. It is large, and not nearly so common here as *Actinophrys sol;* indeed, I only know one pond, a mill-lodge, from which I occasionally get specimens; in this the water is somewhat warm from the waste steam which, on condensation, runs into it. It differs from Actinophrys, as I have said, in being larger, but its most obvious distinction is the fact of its being separable into two layers—an outer, composed of a single or double row of well-marked vesicles, somewhat regularly placed—the interior not so well-defined. The outer vesicles are in the form of short, six-sided columns, and the broader end outward, in order to form the sphere. The animal is spherical or oval, colourless and hyaline as regards the marginal vesicles; interior frequently clouded. The pseudopodial rays may be numerous or few, granular, tapering, and radiate as in Actinophrys, though not so long proportionately,* and in this genus there is an axial thread of more solid protoplasm in each of the rays, which, though spine-like, and not rigid, yet give strength and support to them. These threads arise from the surface of the interior mass, and reach nearly to the tip of each pseudopodial ray. Food, habits and habitat same as Actinophrys; nuclei numerous, brought out by reagents; contracting vesicles two, on opposite sides, bubble-like. Size of body from $\frac{1}{30}$ to $\frac{1}{100}$ of an inch. Rays about, or not quite equal in length, to diameter of body. In my next I propose to figure and describe the new forms which have come under my observation, though many particulars are wanting before they can be correctly placed.

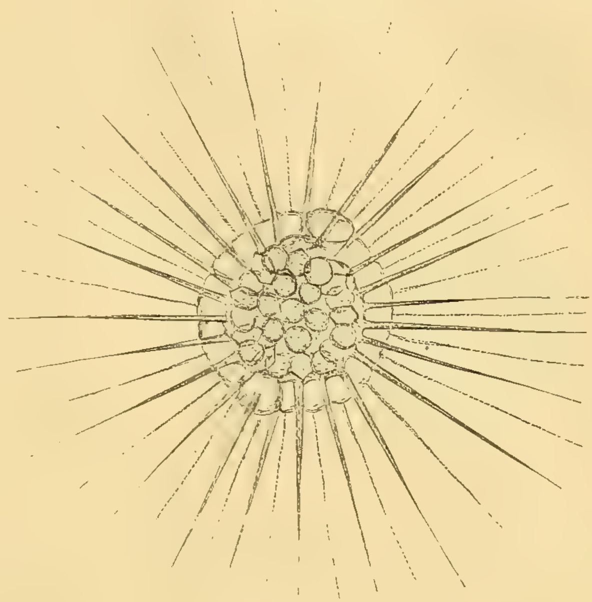

Fig. 13.—*Actinosphærium Eichhornii.*

J. E. LORD.

Rawtenstall.

P.S. I regret, that owing to the excessive wetness of 1891, and other causes, I shall have to defer a description of my new forms until a future occasion.—J. E. L.

* Rays rarely as long as in the figure.

EUROPEAN BUTTERFLIES.

[*Continued from No.* 324, *p.* 277.]

ON my way from Neuchatel to Zermatt I stopped the night at Sierre, where three years ago I got a fine series of Daplidice in the grounds of that most comfortable hotel, the Belle Vue. Podalirius abounds here at the proper season, and Didyma is quite as abundant. Here, too, is to be found in the roads that run through the vineyards to the north of the town, in greater numbers than I have ever seen it elsewhere, three, four, even five specimens on one plant of *Eupatorium cannabinum* being by no means unusual, and this in the full sunshine. I once caught it there at its best, and got some magnificent examples of this strikingly beautiful insect. In the morning, before starting for Zermatt, I took a saunter round the rather extensive grounds of the hotel (once a

château belonging to the noble family De Courten, and containing some beautiful oak-panelled rooms).

Just at the south of a wood which consists chiefly of pine-trees, and which covers a small hill in the grounds (by the bye, these pines are infested by mistletoe, some trees having a score or more of plants on them), I saw a large bright blue butterfly start from a plant of *Colutea arborescens*, and fly up into the wood. That it was something that I had never seen before was certain, and I ran back to the hotel for my net. On my return I was very gratified to find that the butterfly had returned too, and in a trice I had him in my net. It turned out to be a perfect male of Iolas, so rare as a Swiss insect—though abundant enough in southern France—that only three previous captures in Switzerland are on record.

These were all taken near Sierre, so that if the neighbourhood were carefully worked at the beginning of July (mine was taken on the 2nd), I have no doubt other specimens might be got there.

We reached Zermatt on the 2nd of July. The first two or three days were very wet indeed, and my excursions during this time were confined to constitutionals down and up the high road, which was a couple of inches deep in mud. However, the weather cleared at last, and for the remaining ten days of our stay it was beautiful.

My first search for butterflies was made down the valley towards Randa. I got on this occasion, besides commoner kinds, the following species: Sinapis, Hippothoë (var. Eurybia), Simplonia, Bryoniæ, Eumedon, Arion, Mæra, and last, but not least, a nice specimen of that fine insect Gordius, the first I had ever seen alive.

I was surprised to find Cardamines still in good condition. A few days later on I got in the same direction some Dictynna and Athalia, and two more Gordius, together with a very fine series of Delius. These last occurred close to where some strong springs issue from the mountain side, on the right bank of the river, about a mile below Zermatt. These springs saturate the ground just below the place whence they issue, and here grow a good many plants of *Saxifraga aizoides* on which the larvæ feed. Delius is a very easy insect to capture, as in fact are all the Swiss species of the genus.

Eumedon was one of the most plentiful of all butterflies in the valley, and was sure to be seen wherever *Geranium sanguineum* occurred. The imago is as partial to the flower of this plant as the caterpillar is to the seed.

My most successful day was that on which I made an excursion to the Riffel Alp. The path thither leaves the village at the south end. Just beyond the village the path runs alongside the river, and I there saw several Apollos floating about, up and down the steep bank on the left, but having rarer species in view I did not attempt to make any captures.

Soon after the path enters the wood there is a small piece of grass on the left, where I saw several Cratægi, and apparently in fine condition. A little beyond this, in a moist pasture to the right and close to some châlets, I took Dictynna and one or two Pales; the latter, however, is much more abundant at higher elevations.

Between the first and second refreshment-châlets there is a considerable extent of broken rocky ground more or less covered with rhododendron scrub, and having fir-trees thinly scattered over it. Here I saw two or three Palænos careering about in the rapid style peculiar to the genus Colias. After a time one alighted, and I succeeded in netting it; it turned out to be a very fine male.

Keeping on and up, I took a short cut across a meadow or alp lying behind the second refreshment-châlet. Here Phicomine was to be seen in dozens, and in one corner of the meadow I found quite a colony of Orbitulus, a pretty little greyish-blue butterfly which is rather local than rare. Leaving the refreshment-châlet, I did not keep to the mule-path, which here turns sharply to the left, but kept to the gully through which the old path to the Riffel Alp used to run, as I thought I might there meet with Delius; not seeing any, however, I crossed the stream —which was on my right—and passed up the opposite bank to the Alp above. Here Phicomine literally swarmed, and as it flew low and steadily over the short herbage, I could easily have taken scores if I had been so inclined. I did not, however, see anything else at all noticeable, so I re-crossed the stream and made the best of my way up some very steep slopes to the Hotel Riffel-Alp, capturing on my way a few examples of Cassiope.

After taking some refreshment I made for the ridge of the Riffel-Alp, which lies behind the hotel, and on my way up I quite unexpectedly found three examples of that rare plant *Anemone Halleri*, and a few late blooms of *A. alpina*.

When I reached the ridge I could see flying about over a higher part of it to the left, and very rapidly, some light-coloured butterflies which I could not identify, but I deferred making a closer acquaintance with them until I had visited a somewhat boggy corner of the Alp, which I could see some distance away in the direction of the Riffel-Berg.

Passing down to this corner, I saw on my way Phicomine in greater profusion than ever; but though one would expect to see one or two good varieties where a species is so abundant, I failed to detect any here. Orbitulus, too, was plentiful, and I secured one Arcas, the only example that I saw of a very local, if not rare, butterfly.

Some little time before I reached the swampy ground, I saw an occasional Merope, but close to and flying over it the insect was in plenty, and a few minutes sufficed for capturing all that I wanted. Why Merope is not allowed specific rank I cannot

imagine; it is hardly more like Aurinia than the latter is like the female of Cynthia, the distinctness of which no one doubts for a moment; and the same remark applies quite as (or even more) strongly to Provincialis and Desfontanii, two other very beautiful varieties of Aurinia, though they are very unlike the type, and still more unlike Merope. Moreover, the food-plant of Merope is said to be *Primula viscosa*, (though, by the way, I have great doubt as to this being so), whereas Aurinia usually feeds on Scabious and Plantain, and never, I believe, on any kind of Primula. Having done with Merope, I turned my steps towards the place where I had seen the white butterflies. On my way thither I passed over a large space of ground where *B. lunaria* was growing in such profusion as I never saw elsewhere: the plants stood so thickly that it was almost impossible to put one's foot down without treading on one; they were, too, unusually large and robust, and oh! how different from the few puny examples I have seen growing in England of this curious little fern.

About half-way between the swamp and the ridge, my eye suddenly fell on a beautiful male Cynthia settled on the ground a yard or two away, its white checkered wings outspread after the manner of the genus. I had never seen this insect before, but there could be no mistake about its identity, for no other Swiss Melitea has any white on the wings.

Approaching carefully, I struck too hurriedly, the net hit the ground, and the prize was gone! I wasted more than an hour about the spot, but I did not get a glimpse of another specimen there. The white butterflies turned out to be Callidice, a very restless insect and a very rapid flyer, but by quietly waiting at one spot and making a rapid dash as one passed near me, I managed to net four or five, and I got two or three more by stalking them, when they settled on the ground as they occasionally did.

All the specimens were males, and in good condition. (A day or two later, I got half-a-dozen more above the Riffel-Berg Hotel, one of which was a female.) Whilst I was catching Callidice, I saw another Cynthia, and secured it, and subsequently I found a spot where a brood had evidently just hatched out. I got a number of fine fresh specimens, but unfortunately only one of them was a female. The white checkers are wanting in this sex.

On another occasion, I made an excursion to the Schwartz-See for the purpose of getting Gorge, but I only saw two specimens, and one of these escaped me. I took some fine Tyndanis and Lappoda, however, and saw a few Palæno and Callidice, but on the whole this was not a successful day. My attention was turned chiefly to butterflies, but I observed a number of plants of *Lloydia serotina*, and of *Ranunculus rutæfolia* on the alps round the Schwartz-See Hotel.

We left Zermatt on the 14th July for Berisal, where I found Gordius quite plentiful. I may say here, that this insect is far finer in colour and larger on the Italian side of the pass. A German gentleman staying at Berisal made an expedition to Crevola, and returned with a fine series caught there; it was very interesting to notice the marked difference between these, and those he had taken at Berisal. All the Swiss species of Parnassus are to be obtained here. Mnemosyne is fairly common quite close to the hotel, and is extremely abundant on the alp high above the second refuge, where I also saw Eurybia, Lathonia, Carthemi, etc.

The male of Goante is by no means uncommon on the roadside just beyond the bridge (which is about ten minutes below the hotel), but the female is rare. Hylas, Eros, Pheretes, Donzelii, Damon, Alcon, Escheri, the rare Lycidas, Parthanie, Didyma, Hermione, and numerous commoner species may be taken on or near the roadside, between the bridge and the second refuge, but every fine day in the season witnesses several nets going all along this road, so that it would seem almost a wonder that anything should escape; nevertheless, the species do not appear to diminish in numbers from the annual raids made on them.

Both Hippothoë and Virgaurex are plentiful all about Berisal, the latter being especially abundant in the rough valley which runs up from the bridge to the Bortel-Alp.

Here, too, Apollo and Dolius are common, and a few Arcas occur. High up above Berisal, on very rough stony slopes near the snow-line, I caught about a dozen Gorge, but it is a very wary insect and by no means easy to take on its favourite ground. I only saw one Cynthia, but I believe it is sufficiently abundant on some of the high alps above the hotel.

Besides the butterflies I have mentioned above, and the commoner kinds, I got specimens (more or less) of each of the following species: Euphemus, Asteria, Melampus, Stygne, Medusa, Celo, Euryale, Lavateræ, and the pretty little Sao, which is rather common almost everywhere.

One day I explored the ground round the Hospice, but with small results; I saw a marmot, one or two Palæno, and a few Lappona, but nothing else.

When returning to Berisal I took the low, and in some places extremely narrow, valley which runs nearly straight down from the fourth to the second refuge.

The old mule-road over the pass went through this valley; this road after eighty-five years' disuse is still plainly marked in many places, but portions of it are nowadays extremely rough, avalanches having indeed carried it away altogether in places, and in others covered it with a chaos of withered fir-trees and enormous boulders, so that it is anything but an easy matter to get down the valley at all.

The venture was not repaying, nevertheless I got a good series of Arcania, var. Darwiniana, and a few commoner kinds.

I devoted one day to a visit to the Bel-Alp for

Palæno, which I had seen there in 1890. It occurs abundantly on the slopes just below the Bel-Alp Hotel. The east side of these slopes incline steeply towards the Aletsch Glacier, which is in full view of them, and require cautious walking, They are covered with the Rhododendron scrub which Palæus so affects. The day was not altogether auspicious, but I caught a fine series, including two lovely females. On my way down I did not keep to the path, but at first bore a good deal to the left, passing over some very broken and undulating ground where were scattered here and there a few large fir-trees. Just as I reached a little rough hillock which lay in my way, a great black wood-pecker got up from the other side, and flew leisurely to one of the fir-trees, up the trunk of which it climbed, keeping the trunk, however, between itself and me, and peeping curiously round at the stranger who had ventured to trespass on its lonely fastnesses. I think it was an old bird, for the brilliant crimson crest was very conspicuous.

Another excursion was to the Pfyn-Wald, a wood of pine-trees—interspersed with grassy spaces—which lies between Leuk and Sierre. Meleager and Sebrus are both taken there, but I was not fortunate enough to find either the one or the other. Four years ago I got a pair of Meleager there, the female being the brown variety named Steveni. The true home of this butterfly is Digne and its neighbourhood. I got one good Camilla (greatly to my surprise, as I never saw any honeysuckle in the Pfyn-Wald), a few fine Arion, some Dia and Dryas, and two or three Stellatarum. This last insect is very abundant in the Rhone valley.

As to plants at Berisal, I saw there the rare and curious *Campanula excisa;* it was abundant within a short distance of the hotel. I have never seen the plant elsewhere. All four of the Swiss species of Pyrola, too, occur close to the hotel, and Secunda is very plentiful and fine on the Alp; to the left—a short distance beyond the Simplon Hospice—it grows amongst the low bilberry bushes.

When we left Berisal at the end of July, we went to Aigle. Here I obtained a few Camilla, Sibylla, Quercus, *W. album*, Ilicis, Æthiops, one Althææ, (this insect in the proper season is abundant at Aigle, but I was too late for it), and about a dozen Actæa var. Cordula. I saw two Iris, a butterfly which is generally abundant here, but I was not lucky enough to take any. From what I saw and heard, I think Aigle—or perhaps better still Sepey, higher up the valley towards the Diablerets—would be a capital centre for Lepidopterists; but at Aigle itself musquitos are very troublesome to new-comers in July and August.

There is an exceedingly rare fern to be found near that place; I refer to *Asplenium fontanum*, which grows abundantly on the rocks that bound the road on the left, on the way up to Sepey. To see such a scarce plant as this in situ would repay any botanist for the trouble of a visit to this—in spite of musquitos—very charming place; moreover, the hotel (Beau Site) is one that can be honestly recommended, for its comfortable arrangements and very moderate charges.

R. B. P.

Eastbourne.

NOTES ON THE SITE OF HASTINGS.

By T. V. Holmes, F.G.S.

IN the present day the additions yearly made to our larger towns consist of habitations and workshops, built on sites of very various degrees of merit or demerit. Here a healthy plateau becomes covered by "desirable villa residences;" there, on marshes below high-water mark, appear factories and streets of small dwellings, adjoining newly-excavated docks. But an ancient town owed its existence to its natural advantages of soil and situation over all other spots in the district. The site of ancient London, for example, consists of a gravel-capped plateau close to a navigable river; water for domestic use being easily obtained from shallow wells, and the elevation of the ground obviating any fear of floods, and being comparatively advantageous for purposes of defence. And the more ancient the town the more heed did its founders pay to defensive strength, either in the shape of a strong site for the town itself, or in the proximity of a naturally strong position, which might become a refuge for women and children, and a place for the storage of valuables, during the inroad of some hostile tribe or nation.

Though the site of Hastings is very different in character from that of London, it is yet, as evidently as the great city on the Thames, a place which must have been occupied as a town from the earliest times. But the record of Hastings is not one of gradual development as that of London has been. Starting as a mere fishing-town or village, Hastings became, eight hundred years ago, the Premier Cinque Port. Centuries of decline, the result of physical changes, followed, yet during the last half-century it has so greatly extended and developed itself, that it is now much more decidedly the Premier Cinque Port than it was in the days of the Norman kings. Yet it cannot be said that the importance of Hastings Castle tended to counterbalance the destruction of its harbour, and preserve a continuity of existence to the town. For while the castle of another of the Cinque Ports, Dover, is now the centre of extensive modern fortifications, Hastings Castle was allowed to fall into decay as early as the fourteenth century.

In order to get some knowledge of the geological structure of the district immediately surrounding the town, we cannot do better than take our stand on the massive stone groyne which juts into the sea under the East Cliff of Hastings. The East Cliff is seen to

be composed of massive sandstone, and to rise to a height of about 200 ft. Rock of a similar kind is visible in the Castle Hill, west of the valley in which the old town lies. As we look eastward, however, we notice that the sandstone beds, which form almost the whole of the East Cliff, rise gently in the direction of Fairlight Glen and Lover's Seat, while below them a walk along the shore will reveal a greater and greater thickness of strata of a mainly clayey nature. Below Lover's Seat there is much undercliff, and the only rocks visible are massive sandstone capping the hill and mottled clay on the foreshore.

In this mottled clay, which belongs to the series of beds known as the Fairlight Clay, we have the lowest strata belonging to the Hastings Sands, and the lowest visible in this south-eastern district except the Purbeck Beds near Battle. The overlying sandstone beds of the East Cliff and Castle Hill belong to the Ashdown Sands. But a little eastward of Hastings Pier a fault, having a downthrow to the west, throws down sandstone belonging to the higher which comes out to sea at Folkestone. Westward, beyond Pevensey Level, we see the South Downs jutting into the sea at Beachy Head; for we are now on the highest point of the coast between the North and South Downs. In addition to the enjoyment of a magnificent panoramic view, we also attain to a true perception of the proportions of the great anticlinal of the Weald, in the centre of which we are standing. It is seldom indeed that so good an opportunity occurs of noting the true nature of an important anticlinal as compared with the figures given in geological manuals.*

The second spot is Hastings Castle Hill. But the best place for a view is not within the walls of the castle, but at a point sixty or seventy yards northward. The Castle Hill, at the southern or seaward end of which the castle stands, broadens and also increases gently in height northwards. But on the southern end there is a little knoll, the sides of which become steeper and steeper towards the sea, and on this knoll is the castle. Examination of the ground

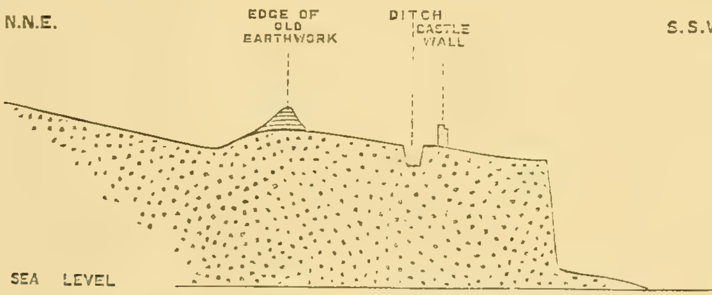

Fig. 14.—Section through ancient Earth-works and Castle, Hastings.

Tunbridge Wells series against the Ashdown Beds. This fault is known as the White Rock Fault. Thus, while Hastings stands upon Ashdown Sands, its modern suburb, St. Leonards, is built chiefly on Tunbridge Wells Sand.

Two spots in this district are worthy of special mention as affording views of unusual extent and interest. The first is the coast-guard station at Fairlight. The view from this point is not so well known as might be expected, because most of the visitors to the bold and picturesque cliffs east of Hastings, whether driving or on foot, seldom go beyond Lover's Seat. Nevertheless, the most extensive views are those obtainable after crossing the glen beyond Lover's Seat, and ascending to the coast-guard station beyond. From St. Leonards to this point the cliffs gradually rise, while they sink with much greater rapidity hence towards Dungeness. Close to the coast-guard station the new ordnance map shows a height of 478 ft. Gazing eastward, we look down on Rye and Winchelsea, and across the broad flat of Romney Marsh to the long chalk ridge of the North Downs, shows that while the mediæval castle occupies only the southern half of the knoll, the whole of it was fortified in prehistoric times. A bank of earth of considerable height still surrounds its northern end, where the natural strength of the position is least, and dies away as the slopes steepen on the eastern and western flanks. The builders of the mediæval castle, not wishing to occupy so much ground as the owners of the prehistoric entrenchment, cut a deep and broad ditch across the rock from east to west, so as to separate the portion they required from the rest of the ancient stronghold, in the manner shown in the diagram section above.

From the northern edge of the ancient fortress the spectator can survey, looking eastward, the "old town" of Hastings in the valley and the East Cliff beyond. Gazing westward we may see the rest of Hastings and St. Leonards, and in the distance the long chalk ridge ending at Beachy Head. Northward the ground gradually rises, but for three or four miles

* For a full account of the geology both of Hastings and of the Weald district generally, see the "Geological Survey Memoir," by Mr. W. Topley.

appear the rolling, well-wooded hills of Hastings Sand around Ore and Hollington.

As we stand on the edge of the prehistoric fortress, and, surveying the sheltered valleys on each side, remember that in addition to dry sandy soil and a little stream in both, there was also an excellent natural harbour in one of them, from some very ancient prehistoric period down to the twelfth century, it becomes evident that Hastings must have been the site of a town from a very ancient date—a date compared with which the landing of Julius Cæsar is but a modern event. That we find no mention of Hastings as a place of importance during the Roman Occupation is only what might be expected. For we must not forget that Anderida (or Pevensey), which certainly was a Roman port, must have once possessed a very much more extensive harbour than that of Hastings, and as the two places are only eleven or twelve miles apart, if Anderida was a kind of Roman Portsmouth, Hastings is very unlikely to have held any equivalent rank.

But it also appears that, at a later date, the eastward drift of the shingle in the English Channel had injured the more westerly harbour of Pevensey before it had begun to damage that of Hastings. This is evident from the fact that, shortly after the Norman Conquest, Hastings became the Premier Cinque Port, while Pevensey's importance had been so much reduced that it figures simply as a "Corporate Member" of Hastings, its head port. William the Conqueror is said, by some historians, to have landed at Pevensey; by others, at Bulverhithe.* It appears to me that all probability is in favour of the latter spot. For to have disembarked at Pevensey would have meant the landing of the Norman army at a spot separated from the higher and drier ground around Battle and Hastings, by a breadth of three miles or more of marsh and water. The exact proportions of marsh and water at that time cannot be ascertained, but neither could have been desirable. Then, as just noted, the harbour at Pevensey had much degenerated in the eleventh century, a fact which must have been known to the wary and sagacious William. But the haven at Bulverhithe, only two or three miles west of Hastings, began to deteriorate about the same time as that of Hastings, and was probably in a better condition than Pevensey Harbour in the year 1066; and Bulverhithe was not separated by swamps from the higher ground on which the subsequent movements took place.

The decline of Hastings seems to have begun very soon after the Norman Conquest, for in the time of Henry II., Rye and Winchelsea were practically added to the Cinque Ports, to "complete the number of the twenty Hastings ships."† I have already mentioned that the harbour which gave Hastings its position as a port during the reign of the Norman kings was in the valley west of the Castle, commonly called the Priory Valley. Its former position may easily be detected in the present day. At White Rock Place on the west, and at the Castle Hill eastward, the cliffs come close to the beach. Between the spots just named, there is a broad, flat shingle-covered area, occupied by Carlisle Parade, Robertson Street, Trinity Church, the Memorial Clock-tower, etc. The streets which diverge from the Clock-tower in a north-easterly or north-westerly direction begin to rise at a very short distance from that monument, the rise in the ground marking the limits of the shingle flat. But if we go due north of the Clock-tower to the cricket-ground, we enter an open space of six acres, a few feet below the level of the shingle flat, and see at once that we are standing on the site of the silted-up ancient harbour of the Premier Cinque Port. The broad shingle flat southward must have covered a considerable breadth of ground soon after the Conquest; for on it a Priory of Austin Canons was founded in the reign of Richard I., and dedicated to the Holy Trinity, from which it would seem that at that time the shingle was considered to be a permanent addition to the land. But we learn, that in consequence of the gradual encroachments of the sea, the Priory buildings were inundated and their inmates compelled to abandon them. Sir John Pelham, however, gave them lands at Warbleton, near Heathfield, to which they retired in the reign of Henry IV. No doubt, a long period in which the deposition of shingle had been slow and gradual was succeeded by others of alternating gain and loss of land, the former, on the whole, predominating. The effect of the action of the sea on the coast is, speaking generally, to reduce the prominence of promontories, and to fill up bays with silt and shingle. But a result of storms is occasionally the sweeping away of large quantities of shingle from a spot where it has been gradually accumulating, and its deposition elsewhere. The material thus removed is, however, usually soon replaced by fresh deposits from the same quarter.

The history of any considerable breadth of coast is sure to offer some striking examples of the changes which may be suddenly produced after a long period of comparative quiescence. For example, the old ordnance map of the coast of West Hampshire and East Dorset, on which the work of the Geological Survey has been done, shows the mouth of Christchurch Harbour as nearly the same distance from Hengistbury Head, on the south, as from the land on the northern flank of the harbour. But in 1880, owing, I believe, to the (then) recent removal of masses of ironstone from Hengistbury Head, I saw that shingle had come round the promontory in such abundance as to deflect the mouth of the harbour about a mile and a half eastward. In 1888, the mouth was almost in the position it had occupied when the map was made, storms having combined

* The Anglo-Saxon Chronicle leaves this point uncertain.

† "The Cinque Ports" (Historic Towns Series), p. 70, by Professor Montagu Burrows.

with the natural tendency of the channel of the Stour and Avon, to breach the shingle bank near the former place of outfall.

In the case of Hastings, it is evident that during the ages when it possessed an excellent harbour in the Priory Valley, scarcely any shingle could have been deposited about the harbour's mouth. This was probably due chiefly to two influences. Firstly, the deposition of immense quantities of eastward-travelling shingle in Pevensey Bay. Secondly, the retention of a large proportion of the rest by the island (about one-and-half miles long, and half a mile broad), shown on Norden's map of Sussex (1616) and on Morden's map half a century later, as existing off the coast of St. Leonards. This island has since gradually disappeared. But if, as is highly probable, it was, previous to the Norman Conquest, both larger and closer to the mainland than in Norden's time, vast quantities of shingle must then have been retained on its western side. At a later date, the shingle, instead of being retained by the island or progressing round its southern coast to places eastward of Hastings, would pass between the island and the shore, and be deposited largely in the Priory Valley. The effect on the harbour of Hastings of the reduction in size and ultimate destruction of this island, must have been similar to that which would occur at Portland Harbour as the result of a breach in the Chesil Bank.

At the time of the Domesday Survey, the town in the Priory Valley had dwindled almost to nothing, while the New Burgh of Hastings, in the Eastern or Bourne valley, had begun to flourish. But the Bourne Valley evidently never possessed a natural basin comparable to that which once existed west of the Castle Hill. So generally does the importance of the earliest of the harbours of Hastings seem to have been forgotten, that in Horsfield's "History of Sussex," (1835), the Priory Harbour is not mentioned, but we read that in ancient days Hastings is said to have had a good harbour formed by a large wooden pier, which projected from the centre of the Marine Parade in a south-east direction. (The Marine Parade is a little east of the Castle Hill.) But in Queen Elizabeth's reign this pier was destroyed by a storm. As late as the year 1834, it was proposed that a harbour should be formed westward of the Priory Bridge, which, judging from a map showing Hastings about the year 1820, must have stood close to the site of the Clock-tower. But nothing was done.

The visitor to Hastings, who now looks down from the old entrenchment on Castle Hill, must then remember that the western valley, in which all the buildings are more or less new, is the site of oldest Hastings, while the much more ancient-looking town in the eastern valley is, nevertheless, the "New Burgh." But though the former existence of the oldest town is almost forgotten, and though Horsfield, speaking of the parish of Holy Trinity, says that the Priory Farm forms the greater part of this district, and that up to the year 1800 the remaining part was waste and unoccupied, yet in the revived site of old Hastings, and not in the New Burgh, are now to be seen the most attractive shops, and the densest throngs of visitors. Nor is any place of amusement more popular in the summer months than the cricket-ground on the site of the once-famous harbour of the Premier Cinque Port.

THE BRITISH PERLIDÆ OR STONE-FLIES.

By W. H. Nunney.

THE insects forming the subject of this short essay are a transition group of the Perennibranchiate division of the Pseudo-Neuroptera, connecting the cockroaches and crickets of the Orthoptera with the neuropterous Ephemeridæ or May-flies. Christened Perlidæ by systematic naturalists, they are popularly known in this country by the collective names of stone-flies, pearl-flies, and water-crickets, this last name, however, being of American origin. Popular names have also been given to the better-known species by anglers, who frequently utilise these insects as an attractive bait for trout and other fishes.

In Britain, at least, the Perlidæ have attracted little attention, the Neuroptera generally having but few students. This neglect is doubtless, in a measure, accounted for by the habits of the creatures themselves, their mostly small size and sombre colour. No really trustworthy guide to the native species has been published in English; indeed, the literature relating to the group is comparatively meagre, and, with the exception of Professor Pictet's fine but costly work on the subject in French, is widely scattered in various general entomologies and periodicals. Such being the case, it is hardly necessary for me to offer any apology for the present paper, written as it is with the idea of providing a ready index to the indigenous species of this family, and thus inducing British entomologists to elucidate much that in the history of the group is still obscure.

The difficulties which stand in the way of a student of the group are, unfortunately, not few. The non-existence of good typical collections open to general view, and the want in our public libraries of several of the most important works of reference, as well as minor difficulties, combine to render research much harder than should be the case. The present author has, so far as possible, worked out the synonymy of species (this is, however, not given here for fairly obvious reasons); but, in some instances, not having been able to refer to the original types, errors must almost unavoidably have crept in. As Mr. McLachlan (the British authority on all matters neuropterological)

remarked to me some while since, nothing of any permanent value in this direction can be done, unless Professor Pictet's types at Geneva, and the types of other nomenclators of the Perlidæ elsewhere, undergo a most searching examination. I had hoped that Mr. McLachlan himself would render the scientific world still more deeply indebted to him, by monographing the British species of the family, but as he has published no such work, he probably thinks that the time is not yet ripe for such a performance.

The Perlidæ have been found in Britain in a fossil condition, specimens having occurred, though somewhat rarely, in the strata of the Upper Eocene formation. In all probability they will at some future period be proved to be of far earlier origin than is at present supposed, as their anatomical structure points to a primitive organization.

The earlier naturalists confounded the Perlidæ with many respects bear a great resemblance to the perfect insects, are usually found in running water; some species prefer that which is almost or quite stagnant, and others find rapidly-moving streams more suited to their mode of life. Their elongated bodies terminate usually in two many-jointed filaments, which, however, become atrophied in certain species, as they attain their adult state. The large head is scaly, and is but poorly provided with masticatory organs, these serving but little for purposes either of attack or defence. Their forms vary slightly in the different sections.

These larvæ breathe usually by means of sacs attached to the underside of the thorax, these sacs having some resemblance to the organs performing a similar function in Sialid, Phryganid, and Ephemerid larvæ.

The Perlina larvæ do not, as was once thought,

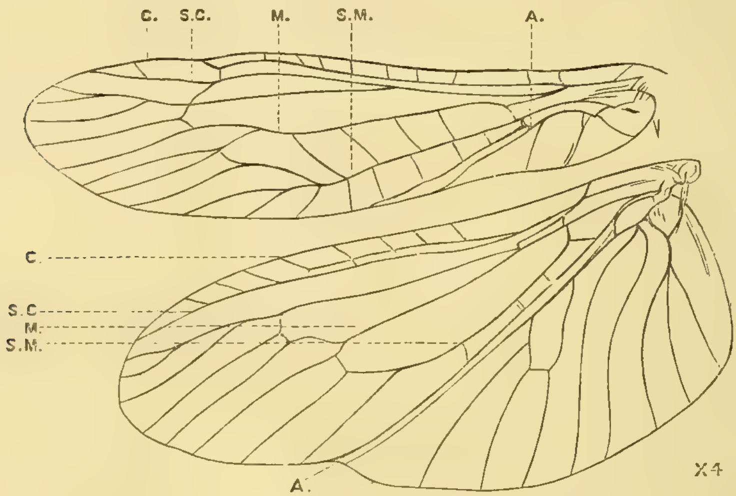

Fig. 15.—*Perla maxima*, X 4: *c*, costa; *s.c.*, sub-costa; *m*, medius; *s.m.*, sub-medius; *a*, anal vein. (Original.)

the caddis-flies, with which, however, they have but little in common. The larvæ were supposed to possess a like economy to that of Phryganid larvæ, long after one Muraldt gave in 1683 a detailed account, accompanied with figures, of the transformations of *Perla marginata*, in a now rare Latin book entitled, "The Ephemeris of Natural Curiosities." Even the illustrious Linné classed the Perlidæ with Phryganidæ. The perfect insects of the Perlidæ may at once be distinguished from the caddis-flies by the non-possession of any decided hairy covering to the wings, and by the very distinct segmentation of the thorax, which is of greater comparative width than is usual with the Phryganidæ. Other distinctive characters are—the possesssion of mandibles and three-jointed tarsi in the Perlidæ, whereas the caddis-flies are without mandibles and have tarsi composed of five joints.

The larvæ, which, together with the pupæ, in construct cases wherein to perform their transformations, and from which they may seize the unwary larvæ of May-flies and other aquatic insects which form their food-supply. Their habit is to lie in wait behind stones and water-reeds, "on murderous thought intent," to surprise and secure their prey. The more brightly-coloured of them effectually conceal their whereabouts from most of their enemies by covering their bodies with a layer of mud.

The pupa resembles the larva, except that it is possessed of rudimentary wing-scales of a leathery texture. When the time arrives for the final change to take place, it leaves the water, and seeks a suitable spot in which to undergo its transformation. With its sharp claws it takes firm hold of the stone or other resting-place *pro tem.*, and, the skin splitting along the back, the insect emerges, having, with the possession of four reticulated wings, obtained its highest development.

The perfect insects of both sexes are very inert,

flying seldom, and then but heavily, and only for short distances, the wings, especially those of the males (which are usually very short, and in some species reduced to mere rudiments), being of little use for purposes of aërial locomotion. The female, after coupling, deposits her eggs, which remain for a time attached to the end of her abdomen, in stagnant or running water, this being according to the predetermined habits of the species. She then, together with the male, does not survive the commencement of the new developmental cycle entered upon by the extruded ova.

Now, as to collecting. Search should be made for the larvæ and pupæ with a water-net—at weir-heads and slight falls of water where the flow is rapid, on stones by the water-side, and in any place that may suggest itself to the collector as a likely haunt for these insects. The imagines may be readily captured both whilst in flight, and when at rest on the ground or on palings, or trunks of trees in the immediate vicinity of the water in which the previous portion of their existence was passed. Beating, as for Coleoptera, may also be employed, with every chance of making captures.

A few words on rearing and preservation. The majority of the Perlina are difficult to rear in captivity, as many of the insects in their earlier states require a constant supply of running water. Some species of Nemourinæ may, however, be bred through in an ordinary aquarium, or failing that, in a jar, provided there be a plentiful store of suitable food.

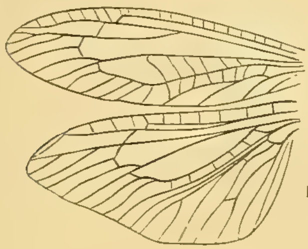
1.

Fig. 16.—*Perla maxima.*


2.

Fig. 17.—*Chloroperla grammatica.*

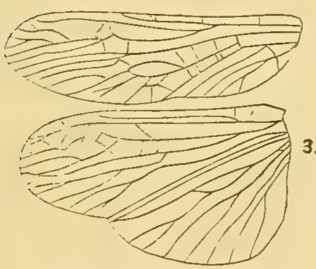
3.

Fig. 18.—*Dictyopteryx microcephala.*

Larvæ and pupæ may be preserved for the cabinet in phials or test-tubes filled either with pure or carbolized glycerine, or the microscopist's mounting medium known as "Goadby's Fluid," as this mode of treatment prevents the alteration of form and colour so prevalent when these larvæ are allowed to dry. Kerosene and benzoline are also useful preservatives. I do not advocate the use of spirits of wine, as by it the delicate colours of the insects are modified or entirely destroyed, though the form remains unaltered. As regards the perfect insects, the ordinary modes of preservation may be adhered to. Some specimens of each species should, however, be put up in phials filled with glycerine or other preservative fluid, to prevent as much as possible the fading of the colours. A supply of test-tubes should be taken to the collecting-ground, so that individuals of each species may be placed in fluid as soon as they are captured.

In labelling these tubes, it is advisable to prepare two labels, bearing parallel information relating to name, date, and place of capture, etc. One of these labels should be attached to the outside of the tube, and the other enclosed with the specimens.

All pinned specimens intended for the cabinet should be set as soon as possible after capture. The wings of some species, if allowed to become dry, cling


4.

Fig. 19.—*Isogenus nubecula.*


5.

Fig. 20.—*Isopteryx tripunctata.*


6.

Fig. 21.—*Capnia nigra.*


7.

Fig. 22.—*Tæniopteryx nebulosa.*


8.

Fig. 23.—*Nemoura variegata.*


9.

Fig. 24.—*Leuctra fusciventris.*

so around the body, on the insects being relaxed, that it is almost impossible to separate them without doing considerable damage to their delicate membranes.

Having now given the above general information, and as it will be necessary to explain the application of the technical names given to the various portions of the wings of the Perlina, I cannot do better than reproduce, at this place, the note on the subject given in Mr. F. Walker's "Catalogue of Neuroptera in the British Museum." This will enable the intending student to understand the synopsis and descriptions of genera that follow.

"The five principal veins of each wing are :—1, the costa, which forms the fore-border; 2, the sub-costa, which is parallel to the costa and not far from it; (3), the medius, which springs directly from the side of the sub-costa, is in juxtaposition with it for a small space, then diverging, divides the wing into two almost equal parts, and is bifurcate at two-thirds of its length; (4), the sub-medius, which springs near the internal angle of the wing, and terminates in the middle of the hind-border, and is bifurcated very near its beginning, its fore-branch forming the anterior sub-medius, and its hind-branch the posterior sub-medius; (5), the anal vein, which is near the base, has a short course, and of which it is often difficult to distinguish between the principal and secondary branches. These veins divide the wing into four principal regions, which are thus named: (1), the marginal region, comprised between the costal and sub-costal veins; (2), the sub-marginal region, between the medius and the anterior sub-medius; (3), the median region, between the medius and the anterior sub-medius; (4), the anal region, which contains all the internal part of the wing between the lower sub-median vein and the anal angle, and in which the vein of the same name ramifies. There is, besides, the sub-median areolet, between the branches of the sub-median vein. The principal line of transverse veins, or Parastigma, divides the first, second, and third regions into two parts, the basal and terminal part. The basal part of the marginal region is divided longitudinally into parts by the vein accessory to the costal, and thus contains three principal areolets, the external basal areolet, the internal basal areolet, and the terminal areolet. In the hind-wings the sub-marginal region is divided longitudinally by a vein accessory to the median-vein, not by one accessory to the sub-costal." This description is a general one, including all the members of the group. The several generic variations are shown in the accompanying illustrations, a reference to which will greatly assist a right understanding of the text. The venation is perhaps the most useful character upon which to base a classification of the Perlidæ, notwithstanding individual variations, but a closer comparison than has yet been made of the anal and other appendages might possibly afford sure points for the identification of species. Mr. McLachlan considers Pictet's terminology defective, and holds that "the nervure accessory to the costal" is the true sub-costal. As, however, Pictet's nomenclature amply serves my purpose in the present paper, I merely note the disparity and pass on.

The following synopsis of sub-families, genera, and species, although of course not absolutely perfect, is, I venture to think, sufficiently reliable for the purpose of enabling the student to identify with certainty, and with but little trouble, any of our native stone-flies of which descriptions have been published. Although I am confident of there being several undescribed British species in collections to which I have access, and elsewhere, I prefer not to publish descriptions of them until my knowledge of the group is augmented.

In the following table capitals refer to sub-families and genera; italics indicate species, which follow under their respective generic heads.

General Characters.—Body depressed, elongated; sides parallel, or nearly so; prothorax large; antennæ long, setaceous; wings unequal, posterior ones broader than the anterior; tarsi three-jointed; two abdominal setæ usually present: Perlidæ.

Characters of Families, Genera, and Species.

A. Tail bristles present.
B. ,, ,, long.
C. Palpi setaceous: Sub-Fam. 1, PERLINÆ.
D. Anal region of hind-wings large.
E. Terminal part of submarginal region divided by cross veins: Dictyopteryx.
Veins of submarginal region very regular, forming square cells: *Rectangula.*
Veins of submarginal region irregular; cells seldom square: *Microcephala.*
EE. Terminal part of submarginal region not divided by cross veins.
F. Marginal terminal areolet with at least two cross veins.
G. Accessory vein of sub costa much branched and very irregular: Isogenus.
Front wholly black; a brown costal cloud above middle of wings: *Nubecula.*
GG. Accessory vein of subcosta without branches or with one or two regular bifurcations: Perla.
Prothorax spotted with black: *Maxima.*
,, unicolorous brown.
,, large, wider than the head: *Marginata.*
,, small, narrower than the head: *Cephalotes*
FF. Marginal terminal areolet with but one cross-vein, beyond which the accessory vein terminates at the costal vein: Chloroperla.
V-mark on head with a transverse band behind: *Rivulorum.*
V-mark on head isolated, without band: *Grammatica.*
DD. Anal region of hind-wings almost wanting: Isopteryx
No spots between the ocelli: *Torrentium.*
Small black spots between the ocelli: *Burmeisteri.*
Prothorax small, wholly yellow: *Apicalis.*
,, medium-sized, caudal setæ entirely yellow: *Tripunctata.*
CC. Palpi filiform.
BB. Tail bristles long: Sub-Fam. CAPNIINÆ.
Tips of wings without cross veins: Capnia.
Dark shining brown, with middle of abdomen yellow: *Nigra.*
AA. Tail bristles rudimentary or wanting: Sub-Fam. NEMOURINÆ.
I. Veins of parastigma not forming an X.
BBB. Tail bristles rudimentary: Tæniopteryx.
Wing fasciæ indistinct, or less in number than three.
Femora brown; wings opaque: *Nebulosa.*
Wing fasciæ never less than three; distinct in female, faint in male: *Trifasciata.*
H. Labial palpi very short, placed far apart: Leuctra.
Prothorax long, constricted in front and behind; abdomen pale, yellow above: *Geniculata.*
Prothorax with three elevated longitudinal lines; antennæ wholly blackish, feet and wings brown: *Fusciventris.*
BBBB. Tail bristles wanting.

II. Veins of parastigma forming an X.
HH. Labial palpi short, near together: NEMOURA.
Prothorax a little longer than wide; meso and metathorax with central notch; antennæ yellow at base; wings brownish grey, veins darker: *Variegata.*
Antennæ wholly black; wings white, clouded with grey: *Meyeri.*
Prothorax as wide as long, shining; wing veins edged with dark grey: *Nitida.*
Prothorax longer than wide; head and antennæ light brown; feet pale: *Cinerea.*
Posterior femora wholly dark brown; wings opaque with the base yellow: *Humeralis.*
Shining black; prothorax rugose, with a dorsal furrow; legs and feet dark; wings brownish with darker veins: *Sulcicollis.*
Dark shining brown; antennæ with a slight pile; feet pale; wings semi-transparent, veins pale: *Inconspicua.*

(*To be continued.*)

NEO-DARWINISM.

By A. G. TANSLEY.

IV.—THE HYPOTHESIS OF CONTINUITY APPLIED TO THE SOLUTION OF THE PROBLEM OF HEREDITARY TRANSMISSION.

WE must now consider more fully Mr. Galton's and Professor Weismann's theories of heredity—the two theories which explain the problem of transmission by supposing that the substance which is the specific bearer of hereditary tendencies is continuous from generation to generation. And it must be again insisted that Mr. Galton's theory is not practically identical with Professor Weismann's, as has been stated *; nor is it a mere modification of Mr. Darwin's, as has also been stated.†

To put it briefly, it differs from the former by its "preformational" character, and from the latter by its substitution of continuity for redevelopment. Hence, though it stands intermediate between these two theories, it differs from both in important respects.

It occupies an extremely important place in the development of thought on the question of the mechanism of heredity, through having first stated in a precise manner this idea of continuity.

Mr. Galton's profound anthropological studies convinced him that the phenomena of the transmission of inherent or congenital characters were *the* important phenomena of heredity which required explanation, and this caused him to formulate the hypothesis of the continuity of residual gemmules as the main idea of his theory. Mr. Darwin, it is true, was compelled to suppose that certain of his gemmules remained latent for many generations, in order to explain the facts of atavism, but the phenomena which Pangenesis was especially devised to explain were, as we have seen, the supposed transmission of acquired characters. Mr. Galton, on the other hand, while accepting the Pangenetic explanation of the few cases in which he thinks such transmission probable, relies on the theory of continuity to explain the main facts of heredity. It is obvious indeed that the assumption of the continuity of a certain amount of germ-substance is necessary to explain the latency of characters for one or more generations. Darwin, as we have seen, recognised this in his atavistic gemmules. But the question which we have to face now is, whether this assumption cannot and ought not to be carried farther, so as to make it the central idea of our theory of hereditary transmission.

Mr. Galton goes so far as to say that it is "indeed hard to find evidence of the power of the personal structure to react upon the sexual elements that is not open to serious objection;" and "we might almost reserve our belief that the structural cells can react on the sexual elements at all." Nothing can be clearer than his recognition of the ability of the theory of continuity to explain the main facts of heredity.

Professor Weismann was led to exactly the same conclusion from general biological evidence, but his theory took a different form, partly from its having been promulgated nine years later than Mr. Galton's —during which time the ceaseless activity of research had brought to light many new facts—and partly from his attention not having been chiefly concentrated on anthropological phenomena.

Mr. Galton conceives of the body as consisting of "organic units," each of which he thinks must have had a separate origin. Hence he conceives of the germ substance (stirp), of every fertilised ovum as consisting of an enormous number of gemmules, and each "organic unit" of the body as being represented by one or more of these gemmules. In this way only does he conceive it possible to understand how a child can inherit minute features, some from one parent and some from the other (particulate inheritance). But it is not clear that Mr. Galton is correct in arguing from such phenomena to the existence of separate organic "gemmules." It is doubtless true that the separate "potentialities" (using this term in its widest sense) of the various minute features must exist, but since the features themselves are only the final outcome of a long course of ontogenetic development, it is quite possible that they may all exist in the germ simply as differences of mutual arrangement and as differences of motion of the parts of a specific substance (the germ-plasm of Weismann). Still, there is no doubt that Mr. Galton's gemmules are very much easier to deal with, and much clearer conceptions can be formed of the manner in which they are supposed to behave. Nevertheless, as we shall see presently, it seems on the whole more probable that they do not really exist, but that we must conceive of the "germ-plasm" as containing the potentialities of the organism. Admitting, however, for the present, the

* Wallace's "Darwinism," p. 443.
† Poulton. Note in Weismann's "Essays on Heredity," p. 173; and Lloyd Morgan's "Animal Life and Intelligence," p. 135.

existence of Mr. Galton's gemmules, let us see how he explains the processes of heredity.

Of the whole collection of gemmules in the stirp of any organism, derived from various ancestors in various proportions, comparatively few achieve development. Of the few which do, each develops into an organic unit of the adult. The conditions which determine the development of the individual gemmules are many and complex, and a great number of struggles between and rearrangements of the different varieties of gemmules representing the same unit take place before a position of equilibrium is attained. Obviously, on the whole, the process will result in a natural selection of the strongest and most suitable gemmules. The residue of gemmules, after this segregation has been effected, remains latent during the life of the individual, and from this residue the sexual elements are derived.

Professor Weismann's idea of heredity is that it is "brought about by the transference, from one generation to another, of a substance with a definite chemical, and above all molecular, constitution." * This fundamental substance, the germ-plasm, has a very complex structure. At the beginning of the process of segmentation in the development of each individual a certain portion is segregated and remains unchanged, to be handed on to the next generation (Galton's residual gemmules); the rest undergoes such changes during the process of growth of the developing organism that it directs and determines the construction of the body of the latter. Thus each generation has an identical starting-point, and would be expected under the same conditions to give rise to an identical result.

Here we recognise the same idea of continuity that we find in Mr. Galton's theory. But we must next inquire what Professor Weismann means by germ-plasm, and we soon discover that his conception of this substance differs essentially from Mr. Galton's. The idea of particulate inheritance did not compel Professor Weismann (as it had done Darwin and Galton) to suppose that separate gemmules, each giving rise to an organic unit of the body, existed in the germ-cells. "The germ-plasm is that part of a germ-cell of which the chemical and physical properties—including the molecular structure—enable the cell to become, under appropriate conditions, a new individual of the same species." † As it appears that the essential feature in fertilisation is the fusion of the male and female pronuclei, we must localise this germ-plasm in the nucleus of the germ-cell. Indeed, in the case of flowering-plants the male nucleus only enters the egg-cell. Professor Weismann further takes over Nägeli's conception of idioplasm which we have already explained. He does not, however, follow Nägeli in regarding the idioplasm as a solid network extending throughout the organism, but considers that it, like the germ-plasm, is confined to the nucleus. There is a great deal of evidence accumulated during the last ten or fifteen years to show the supreme importance of the cell-nucleus in the nutrition and general economy of the cell. This would hardly be the place to enter into a consideration of this evidence, but it certainly seems sufficient to justify the hypothesis that the substance which determines the specific character and functions of the cell resides in the nucleus, and this conception is likewise supported by the fact that the nuclear substance of all the cells of the body is directly derived from the nuclear substance of the fertilised ovum, and as we have already seen, it is almost certainly this nucleus which contains the hereditary tendencies. The term idioplasm then, in Weismann's sense, is applied to the whole of the controlling substance of the organism. This is situated in the nuclei, and gradually changes during the course of ontogeny from the small amount of very complex germ-plasm to the very much larger amount of relatively simple idioplasm of various kinds situated in the cells of the fully differentiated parts of the adult organism. At each cell-division during the course of development a simplification and differentiation of its structure takes place, till from possessing, as germ-plasm, all the complex potentialities of the entire organism, the idioplasm of the adult comes to consist of as many different varieties as there are different kinds of cells in the body. The idioplasm of each ontogenetic stage is of such a molecular structure that it not only contains the potentialities of all those tissues to which it will ultimately give rise, but that it also must undergo the differentiation and simplification at the next cell-division necessary to transform it into idioplasm of the next stage. Thus, for instance, the germ-plasm of the first segmentation-nucleus (nucleus of the fertilised ovum) not only contains the potentialities of the whole organism, but is also of such a structure and in such a condition that it must undergo a certain differentiation at the first nuclear division, a differentiation which gives to the first two daughter-nuclei the potentialities of the ectoderm and endoderm, or of the front and hinder part of the body, respectively.* This process goes on in precisely the same manner throughout ontogeny, until finally we arrive at the characteristic cells of the various tissues with their relatively simple but widely differentiated idioplasms.

The divisions of the nuclei corresponding to those cell-divisions which only result in the production of two daughter-cells similar to the mother-cell, may be distinguished as *equivalent* nuclear divisions, as

* "Essays on Heredity" (first edition), p. 168.
† "Ibid., p. 174.

* It should be mentioned that it has been found that by destroying one of the first two segmentation spheres of the frog, only the front or hind part of the body, as the case may be, has been able to continue development (which has, of course, soon been arrested), thus proving the separation at the first cell-division of the potentialities of these regions.

opposed to those we have been considering, which may be called *differentiating* divisions. In the former case we have no differentiation or simplification of the idioplasm, but only simple division.

This luminous conception of Professor Weismann's enables us to understand, much more clearly than has hitherto been possible, the nature of ontogenetic development and its control by the cell nuclei. It is certainly a much more satisfactory conception than that of the successive giving off during the process of development of the preformed gemmules of structure corresponding to different parts of the body. For, if we admit that we must look to the nucleus for the actual germ-substance (taken in its widest sense), the conception of separate gemmules becomes meaningless as well as unnecessary.

There can be no doubt that the hypothesis of the controlling idioplasm gradually being differentiated as the tissue development proceeds, is much more in accordance with what is known of the facts of nuclear and cell division.

On the other hand, it must be admitted that the gemmules of Mr. Darwin and Mr. Galton are easier to manipulate and enable us to explain certain special problems of heredity more easily. But I must reserve a consideration of this point, and an attempt to explain some of these problems on Professor Weismann's lines, for my next article.

(*To be continued.*)

NOTES ON NEW BOOKS.

ANY book by Dr. M. C. Cooke, on any group of fungi, is sure to be welcomed by botanists. His last new work, *British Edible Fungi, How to distinguish Them and How to Cook Them* (London: Kegan Paul & Co.), appeals to a wider class of readers. Our fields and meadows are full of good things, but nobody dare eat them. We are in the position of the man who resolved never to go into the water until he had learned to swim. It is a real pity that our ignorance should have built up such a strong wall of prejudice against all but two or three kinds of fungus, which latter we have apotheosised under the name of "Mushrooms." All the rest, scores in numbers, are damned under the term of "Toadstools." Dr. Cooke is a bold man, and a good gastronome. He has cooked most of our British funguses, and likes most of them. In this beautifully and artistically got-up work, he tells us how to recognise the "good kinds" unmistakably from the "bad" ones. Moreover, he tells us—in language that is appetising—how to cook them! Many people willing to try the experiment of cooking them are in the position the Irishman said the dog was that stole his pennyworth of liver—"the beggar after all had not got the resate." Dr. Cooke is a delightful, not to say a rollickingly delightful, author, and he is at his best in this useful book. It contains thirty-five chapters, on everything connected with British fungi and their culination, and is illustrated by about thirty exquisitely coloured figures of the commonest and best-eating of our British species. The man who would make a mistake in mis-identifying a fungus with this book in his hand puts himself outside the pale of argument. Even if the reader do not enjoy the new kinds of fungus herein described, he cannot fail to enjoy reading the book which describes them.

Delagoa Bay, its Natives and Natural History, by Rose Monteiro (London: G. Philip & Son). Mrs. Monteiro remained in the country her husband had been such a successful collector in, after his death, and she appears to have carried on his work. She is a brave, self-possessed little woman, with a keen eye for humorous situations, and well capable of taking care of herself even among the roughest and rudest of Kaffirs and settlers. Her book is adorned with charming chapter-headings, of flowers and insects, artistically if sketchily combined. It is further adorned by well got-up plates. But the interest of the book is its natural, graceful, and unpretending narrative of an entomologist's life in Portuguese South Africa. Everybody who gets the chance should not fail to read this very pleasing little book.

The Story of the Hills, by the Rev. H. N. Hutchinson (London: Seeley & Co.). The success which attended the publication of Mr. Hutchinson's first book on geology has very properly led to the appearance of the present vol., for which we predict an equal if not a greater success. The author is a man of wide geological and physiographical reading, possessed of the gift of clearly interpreting the writers he reads, and of reproducing their facts and conclusions in easily understood and even attractive language. The illustrations, sixteen in number, are highly artistic, and much embellish the book, which contains ten chapters, and runs to 350 pages. The last chapter on "The Ages of Mountains," is one of the best. That on "Mountain Plants and Animals" is hardly less interesting. We cordially commend this book.

The Field Club: A Magazine of General Natural History, edited by the Rev. Theodore Wood (London: Elliot Stock), Vol. ii. Many of our readers will be acquainted with Mr. Wood's highly interesting little magazine, devoted almost entirely to natural history. We can only say that in its annual volume form it makes an attractive work of reference, as far as it goes. Most of its contributors are not unknown in the pages of SCIENCE-GOSSIP.

British Fungi. Phycomycetes and Ustilagineæ, by George Massee (London: L. Reeve & Co.). Mr. Massee is an old contributor to SCIENCE-GOSSIP, and most of our readers are acquainted with the careful and accurate, not to mention the artistic, finish of his illustrations, as well as his conscientious statement of facts. The present well got-up volume fully sustains

his reputation in this respect. It brings up to date a revision of the two orders of fungi above mentioned, and forms a capital handbook and guide for students desirous of pursuing further researches in this, as yet, only partly-worked department of botanical study.

The Plant World, by George Massee (London: Whittaker & Co.). This is a popular work on botany, very properly considered from the stand-point the editor of this journal has always advocated, viz., that of plants as Living Organisms, subject to similar vicissitudes to those which affect animals. It is a highly readable and instructive little book.

Annals of British Geology, 1890, by J. F. Blake (London: Dulau & Co.). Professor Blake is to be congratulated on the patience and industry which have made this highly useful volume a success. If any evidence were required to indicate the intellectual activity of British geologists, this summary of one year's work would be sufficient. It is a most useful handbook to geological literature, inasmuch as it is not only a catalogue of all the books published, papers read and printed, etc., but a critical digest of the same by perhaps the best geological critic in England.

The Physical Geology and Geography of Ireland, by Edward Hull, F.R.S., etc. (London: Edward Stanford). We had much pleasure in drawing attention to this highly valuable work when it first appeared, and we congratulate the author that a second edition has been so soon called for. Professor Hull has taken the opportunity to revise and improve this useful handbook, which we thoroughly commend to all students of Irish Geology.

Handbook to the Geology of Derbyshire, by J. Magens Mello (London: Bemrose & Sons). This is a second and vastly improved edition in every respect of Mr. Mello's "Geology of Derbyshire." The latter is the most interesting county in England for geology, and no other man is so capable of writing a guide to it as Mr. Mello. Our readers, therefore, will take this straightforward hint.

Geodesy, by J. Howard Gore (London: Heinemann). This small but attractively got-up manual is the best we could recommend to all geodetic students. It is full and clear, thoroughly accurate, and up to date in all matters relating to earth-measurements. The author possesses the gift which Burns desired, of seeing as others see us—or rather, he enables his readers to see geodetic science as he sees it himself.

Colour-Blindness and Colour-Perception, by F. W. Edridge-Green, M.D. (London: Kegan Paul & Co.). This vol. is one of the well-known and highly-prized "International Scientific Library" series. It cannot be doubted that the subject is one of supreme interest. The present vol. is illustrated by three coloured plates. Dr. Green tells us he wrote his book for the benefit of those who may have to test for colour-blindness. He also advances an ingenious theory of his own, worth considering, of colour-perception. Nevertheless, Dr. Green does not seem to have grasped the theories of Helmholtz and Young. Dr. Green's book is a very practical one, although there are strange omissions in it of works and workers in this department of physics.

A Cyclopædia of Nature Teachings (London: Elliot Stock). A very tastefully got-up volume, but one cannot help wondering why a book like this is got up. Nobody wants it; it teaches nothing. It is simply a very pleasant hash from "goody" scientific books, many of which we never heard of before, and which are preserved in these pages from obscurity. The few really good books quoted makes this remark all the more annoying.

Moral Teachings of Science, by Arabella B. Buckley (London: Edward Stanford). This pretty little volume is quite of a different class. Whatever Miss Buckley has to say on natural history subjects is sure to be said well, and will be listened to. So now that she occupies the pulpit, we are prepared for a good sermon; and a better we have not read for some time than that now before us.

SCIENCE-GOSSIP.

In view of the failure, by experiments, of an old-world notion (our readers will find it in Dr. Dick's "Christian Philosopher") that atmospheric explosions would cause rain, it is necessary to point out that no rain could possibly fall unless there was sufficient watery vapour present in the atmosphere. Also, as an American Professor (Blake) has recently shown, there must also be sufficient dust present in the air. This agrees with the current idea of the origin of fogs.

The doyen of British Science, Sir George B. Airy, late Astronomer-Royal, has died at the ripe age of 91 years, intellectually, robustly, and humourously alive till a short time before his death.

We are glad to welcome and recommend Mr. F. V. Theobald's Part 3 of "An Account of British Flies," well printed and illustrated. Parts, one shilling each (London: Elliot Stock).

The small snow-ball and the painted dome of the Lick Observatory, Mount Hamilton, California, contains the largest telescope in the world. It is no less than sixty feet long, with a thirty-six inch lens. The huge instrument is so skilfully adjusted that it can be moved at will with one hand. It is supported on a lofty stand, which is ascended by a splendid spiral staircase. From the upper platform the astronomers, at the end of every two hours during observations, wind the huge weight—600 pounds—of the driving clock with 320 turns of the handle, so that the lens of the telescope may cover the star with mathematical accuracy as it moves through space, and enable the worker to make observations with rigid exactitude.

A necessary adjunct to these observations is the movable floor, which rises and falls by means of hydraulic pressure. A simple but ingenious contrivance, invented by Professor Holden, closes and opens the great shutters as easily as though they were a pair of curtains. The whole of the astronomical establishment and observatory is an isolated community, miles from any sign of life. Frequently in winter the mail stage is delayed from a few days to a week, and no communication or food can be carried to the inmates of the observatory, the snow being many feet deep and the roads impassable. The colony of astronomers and workpeople number between thirty and forty persons, and eight or nine families. Food supplies have to be transported by stage from San José, twenty-eight miles distant. Water is supplied by four reservoirs situated within walking distance of the observatory.

THE oddest expedition that ever set out for the interior of Africa is probably the one Professor Garner is undertaking with a view to studying monkey talk scientifically. His outfit includes phonographs, telephones, photographic apparatus, an electric telegraph, and a set of taxidermist's tools; but the queerest thing of all is an aluminium cage, in which the Professor intends to ensconce himself in the midst of a gorilla forest, in order to hold court among the monkeys. Knowing their fondness for admiring their reflections in mirrors, he is taking some along with him.

THE United States Consul-General at Frankfort, in a recent report, describes what he calls the most momentous experiment in technical electricity ever made since electricity has been rendered serviceable to mankind. The object was to create a current of 200 or 300 horse-power by a dynamo driven by water-power at Lauffen, on the Neckar, 108 miles south of Frankfort, "convert it into a current of intense pressure by specially-devised transformers, transmit it to the Frankfort Exhibition, there re-transform it to a current of ordinary pressure, and in that form apply it to motive and lighting purposes." It is said that fully seventy-five per cent. of the energy created in Lauffen is available in Frankfort; part of the current thus secured is used to illuminate 1,200 arc lights, while the remainder drives a rotary pump which draws water from the Main and forces it to the top of an artificial hill, whence it tumbles as a waterfall on the Exhibition grounds.

THE medals and funds given at the anniversary meeting of the Geological Society, on February 19th, were awarded as follows: The Wollaston Medal to Baron Ferdinand von Richthofen; the Murchison Medal to Prof. A. H. Green, F.R.S.; and the Lyell Medal to Mr. George H. Morton; the balance of the proceeds of the Wollaston Fund to Mr. O. A. Derby; that of the Murchison Fund to Mr. Beeby Thompson; that of the Lyell Fund to Mr. E. A. Walford and Mr. J. W. Gregory; and a portion of the Barlow-Jameson Fund to Prof. C. Mayer-Eymar.

WE confess to a weakness for second-hand book catalogues, and none comes more welcomely than Messrs. Pickering and Chatto's "Book-Lovers' Leaflet." No. 50 (December) is delightful.

Sir Robert Ball, in an article on the new astronomy in the *Fortnightly Review*, is justifiably enthusiastic on the triumphs of spectroscopic photography in extending our knowledge of the heavens. The movements of the stars in a direct line to or from us, which were not noticeable on merely telescopic examination, are now measured with wonderful exactness. Stars at such a distance that if they were brought ten times nearer us they would still be too far away for measurement by the ordinary processes of the observatory, have now their diameter guaged. It is a noteworthy epoch in the history of astronomy when, for the first time, we are able to apply the celestial callipers to guage the diameter of a star. Who would have predicted, some few years ago, that the spectroscope was to be the instrument to which we should be indebted for the means of putting a measuring-tape round the girth of a star? Of the dark satellite of the variable star Algol so much has been deduced by the aid of the new spectroscopic methods that Sir Robert Ball is able to say: "Here is an object which we have never seen, and apparently never can expect to see, but yet we have been able not only to weigh it and to measure it, but also to determine its movements."

THE experiments with sulphate copper as a remedy for potato disease are described in full in the last Quarterly Journal of the Royal Agricultural Society. So, likewise, are the experiments of Sir John Lawes and Dr. Gilbert relating to the origin and preparation of nitrogen, etc., in the soil.

DR. Pfeiffer, son-in-law of Prof. Koch, is stated to have discovered the microbe of Influenza. Let us hope he will be more successful in dealing with it than his marital relative was with that of Tuberculosis, of which we now hear very little.

DR. MAREY, the eminent French physiologist, has been studying the flight of insects by photochronography, an arrangement which allows the exposures of the photographic plates to be made so short as 1·25,000 of a second. His observations indicate that the wings of insects in flight, by meeting obliquely the resistance of the air in to-and-fro movements, act in a very similar manner to the sculls used to propel boats.

SCIENCE is looking up. In Sir William Thomson's worthy elevation to the Peerage, the nation has at length recognised the fact that science is worth as

much as even politics—although any fool can play at the latter!

READ the report by Mr. Haly, curator of the Colombo Museum, in "Nature," December 31st, on his discovery of a medium for preserving the colours of fish and other animals.

WE are very pleased to keep our readers to good things. There is nothing better for them than good catalogues of books, papers, magazines, etc., they may be requiring. Messrs. Dulau & Co. have lately "gone in" for scientific literature. There is now on our table a couple of handy catalogues of "Works on Geology," including Crystallography, Mineralogy, Mining, Petrography, Boulders, Vulcanology, etc., "What d'ye lack?"

WE strongly advise all of our readers who are interested in the subject to read the report of Dr. Marshal Ward's paper on "The Ginger-Beer Plant," in "Nature," December 24th. Dr. Ward shows it is mainly a symbiotic association of a specific Saccharomycetes and a Schizomycetes.

THE last number of "The Entomologists' Record and Journal of Variation" (edited by J. W. Tutt) is a double one, and is crowded with details interesting to entomologists, particularly to those who are prepared to understand the biological value of "variations."

PROFESSOR VICTOR HORSLEY, F.R.S., on January 19th gave the first of a course of twelve lectures on "The Brain" at the Royal Institution. Mr. A. S. Murray, LL.D., on January 21st gave the first of a course of three lectures on "Some Aspects of Greek Sculpture in Relief"; and Prof. J. A. Fleming on January 23rd gave the first of a course of three lectures on "The Induction Coil and Alternate Current Transformer." The Friday evening meetings began on January 22nd, when the Right Hon. Lord Rayleigh, F.R.S., gave a discourse on "The Composition of Water."

WE have received from the "Youths' Companion" Boston, U.S.A.—a capital weekly paper, in which popular science finds a prominent place—a lovely chromolitho strip of various kinds of roses, about two feet by six inches, sent out with the New Year's number, which latter promises even a more lively volume than ever.

THE "Child Life" Almanack and Calendar for the current year (G. Phillip and Son) is one of the best got-up we have seen for the use of young naturalists.

WE have received a reprint of Mr. Arthur Bennett's valuable paper entitled "Contributions towards a Flora of the Outer Hebrides," published in the Annals of Scottish Natural History" for January. Babington and Balfour's estimate of the flora was 349 species and varieties. The present list adds 143 species and varieties, and Mr. Bennett thinks it probable that at least fifty or sixty species will be added, and eventually found to occur.

WE are sorry to announce the death of the veteran French Naturalist, Professor Quatrefages, at the ripe age of eighty-two.

MR. MURRAY announces a new and cheaper edition of the late Professor Moseley's "Notes by a Naturalist on Board the Challenger," one of the most delightful books in the world to read.

AT the last meeting of the Institute of Marine Engineers, a paper (part 2) on Stability, or the "motion of a vessel among waves" by Mr. J. A. Rowe, was read. In the course of a very interesting paper, the author dwelt upon Static and Dynamic Stability, and the oscillations of a vessel among the waves. The action of the waves upon vessels at different angles of rolling was illustrated by diagrams, showing the direction in which the force of buoyancy tended to make a vessel roll. The question of controlling and regulating the heavy rolling of vessels was only touched upon, Mr. Rowe pointing out that from the experience of several nautical men to whom he had spoken, bilge and side keels for this purpose had been found of great value. In the course of his remarks the author suggested that shipbuilders would be greatly aided in designing stable craft if, when a vessel was ordered, they were informed in which trade the vessel would be employed and the nature of the cargo to be carried, inasmuch as a vessel designed to carry one special cargo might not be adapted for carrying grain for example.

MICROSCOPY.

JOURNAL OF THE ROYAL MICROSCOPICAL SOCIETY.—The December part of this welcome and well-edited journal contains, in addition to the useful summary of current researches relating to zoology and botany, the following papers:—"Notes on New Infusoria from the Fresh Waters of the United States," by Dr. Alfred C. Stokes (illustrated); and one on "An Improved Method of making Microscopical Measurements with the Camera lucida," by Sir Walter Sendall (also illustrated).

HOW TO MOUNT TONGUE OF MOTH OR BUTTERFLY.—First take a fine-pointed pair of scissors and carefully cut out the tongue as close up to the mouth of the insect as possible, and see that the tongue is in a nice flat spiral form. Put it into spirits of wine for a few days; take out and put into good clear turpentine, in which it will have to stay for some time, to take out a little of the dark colour, or you will not be

able to see the tracheal tubes nicely. After you have taken out sufficient colour, place the tongue in benzol for a couple of days; then into oil of cloves, to make transparent. Now take a 3 × 1 glass slip, on which you have fastened a tin cell of sufficient depth to take the tongue. Fill up the cell with balsam and benzol until it is nicely rounding on the top, put in the tongue, place on the cover glass, but do not press the glass circle close on to the tin first off; give the benzol time to evaporate, after which you may press the circle down, and when the edge of balsam is hard, ring with shellac cement, finishing off with any fancy colour you like.—*J. Boggust.*

ZOOLOGY.

YELLOW-CRESTED WHITE COCKATOO.—An ingenious device of one of these birds is, perhaps, worthy of record. To take advantage of a heavy, straight-down, warm shower of rain, the bird holds on to the cross-bar of his stand with his beak, lowers himself on the opposite side to his chain (so that the chain hangs over the bar as if over a pulley), grasps both pieces of chain to prevent its running, and then, letting go with his beak, throws himself back downwards, horizontally, wings open, and enjoys himself to the full. His strong beak breaks the links of ordinary parrot-chain, forces open thick rings, and unscrews swivels. This occurs sometimes several times a day; at first he used to bite, and that severely, when he was re-fastened; but after having been well beaten he now contents himself with pecking with sharp blows the perch upon which he is standing. The natural parrot says "Bite I must"; the chastened parrot says "but not my dear (?) master." If two or three persons are talking near him, he will break out into a "jabber without words," accompanied by appropriate gestures, imitating the general resultant of the conversation in a very ludicrous manner. Such things as having mock-fights with the dog, sneezing, dancing, etc., are, I suppose, common accomplishments of these amusing birds.—*T. D. S., Blakiston, S.A.*

BOTANY.

THE COLORATION OF FLOWERS.—Mr. Griset (on page 23) states that plants kept in air-tight and dark bottles will, as a rule, lose their colouring more or less. I also have noticed that on a plant of *Geum coccineum*, which in the open air was producing flowers with scarlet petals, which, however, in the bud were yellow, when moved into a semi-dark cellar the flowers when fully expanded got no further than the yellow or, at best, orange stage. In face of these facts, I hope that the statement that lack of light, whilst altering the colour of leaves, has no effect on that of flowers, will henceforth be omitted from botanical works. I should also like to call attention to a fact, which, as far as I know, has not hitherto been put on record, namely, that whilst the green parts of plants are coloured by granules of chlorophyll, and many yellow flowers by chromoplasts, *i.e.* granules of colouring-matter, blue flowers are more often coloured with blue cell-sap, and red by coloured cell-sap, sometimes mixed with granules. These facts seem to confirm the evolutionary theory that blue flowers have been developed from green through various gradations of yellow and red. This rule holds good, I believe, in roots as well as in flowers, since beetroot is certainly coloured by sap, and carrots, I think, by chromoplasts.—*Henry St. A. Alder, Gt. Malvern.*

GEOLOGY.

THE GEOLOGY OF BARBADOS.—At a recent meeting of the Geological Society, the second part of an important paper by A. J. Jukes-Browne, B.A., F.G.S., and Professor J. B. Harrison, M.A., F.G.S., was read. They stated that the Oceanic deposits rest unconformably on the Scotland Series, with which they contrast strongly in every respect. They are divisible into five portions:—(1.) Grey and buff calcareous marls (Foraminiferal). (2.) Fine-grained red and yellow argillaceous earths. (3.) Pulverulent chalky earths (Foraminiferal). (4.) Siliceous earths (Radiolarian). (5.) Calcareo-siliceous and chalky earths (Foraminiferal). The whole series is more calcareous in the northern than in the southern part of the island, and layers of volcanic dust occur in it at various horizons. There is everywhere a passage from the more siliceous to the more calcareous earths. From the palæontological and lithological, evidence the Authors conclude that the depth of water in which the Oceanic beds were deposited varied between 1000 and 2500 fathoms. The microscopical and chemical evidence shows that the Radiolarian earths are similar to modern Radiolarian ooze; that the calcareo-siliceous earths are similar to what is called by Professor Haeckel "mixed Radiolarian ooze"; that some of the Foraminiferal earths are comparable to *Globigerina*-ooze from 1000 fathoms, and that others greatly resemble European Chalk; and, finally, that the coloured clays bear a strong resemblance to the so-called "red-clays" of modern oceanic areas. Hence the raised oceanic deposits of Barbados seem to present us with an epitome of the various kinds of deposits which are found on the floors of warm seas at the present day. Equivalent deposits are known in Trinidad and Jamaica; and it is inferred by the Authors that the whole Central American and Caribbean region was deeply submerged during the Pliocene period, leaving free communication at that time between the Atlantic and Pacific Oceans. An Appendix by Mr. W. Hill treats of the minute

structure of the Oceanic earths and limestones, and of the Foraminiferal muds and detrital earths; and this is supplemented by a Report from Miss Raisin on the inorganic material of certain Barbados rocks. In the discussion which followed, the Chairman said that since the late Mr. Brady wrote on the "so-called Soapstone of Fiji," there had been no communication on the subject of oceanic deposits of such importance as Mr. Jukes-Browne and Professor Harrison's paper, which dealt with them from a physical, chemical, and biological point of view. In both cases the deposits were held to be of late Tertiary age, and this conclusion made the excessive depths at which the Barbados earths were supposed to have been deposited all the more startling. Possibly the species of *Archæopneustes* described by Mr. Gregory might point to shallower waters. Dr. Blanford asked for further evidence as to the red clay being a deep-sea deposit. The mammalian fauna of South America, as he had pointed out on a previous occasion, could not be explained unless North and South America had been united at times during the Tertiary era. If it was urged that Barbados was on the edge of the oceanic era, the same remark would assuredly not apply to Jamaica. The discovery in Barbados of both *Globigerina*- and Radiolarian ooze, intercalated between shallow-water deposits, was clear evidence that portions of the continental area might be depressed to oceanic depths and re-elevated. Professor Sollas said it could no longer be put forward as an assured fact that deep-sea deposits never enter into the constitution of land-masses. Still, the evidence of the excessive depths claimed by the Authors did not amount to demonstration; it was of the nature of analogy, which was sometimes misleading. It was to be hoped that additional fossils of the Metazoa would be discovered in the chalky beds. A vastly larger number of observations are required to define the bathymetrical limits of a species or group than in many cases we at present possess. Striking examples to general rules are numerous enough to give us pause; even so characteristically a deep-water group as the Hexactinellida has afforded one instance of a comparatively shallow-water species, *Cystispongia superstes*, having been dredged from eighteen fathoms off Yucatan. Professor Harrison pointed out that the evidence upon which the red and mottled argillaceous earths of the oceanic series were considered by Mr. Jukes-Browne and himself to be deep-sea deposits were the close resemblance in physical properties and chemical composition which they present to certain of the modern deep-sea oozes which have been termed "red clays," and that the only organisms found in them were purely siliceous, being principally the remains of radiolaria with a few sponge-spicules. The "clay" occurring in the pure radiolarian marls was also separated, and upon comparison was found to be similar to the argillaceous earths. The term "red clay" appears to have been used in the "*Challenger* Expedition Reports" in a very comprehensive manner, as under it are included not only argillaceous deposits containing but few organisms, but also deposits consisting in some cases of radiolarian and in others of foraminiferal organisms. Mr. J. W. Gregory remarked that as the new echinoid occurred in a limestone at the extreme top of the oceanic series, it in no way disproved the deep-sea origin of the radiolarian marls. He fully agreed with Dr. Blanford in doubting any considerable submergence of the Isthmus of Panama in Upper Cainozoic times; Dr. Maack's collection proved only an eocene or miocene submergence, and the surveys of Lieutenant Wyse and the French engineers of the canal had not revealed any considerable elevation of the recent marine deposits. He exhibited specimens of radiolarian marls from Cuba, which were identical in characters, variation, and mode of occurrence with those of Barbados, and he maintained that this completed the authors' case, and disproved the objection that had been advanced that these deep-sea deposits only occurred on the margin of a volcanic area.

NOTES AND QUERIES.

THE SOLAR YEAR.—Your correspondent T. R. Jones should consult "Weights and Measures" in Weale's Series, where he will find the Calendar fully explained. He has, however, created his own difficulty by confusing between the Sidereal and the Solar Year. The Solar Year contains 365·24222 days, or 365 days 5 hours 48 minutes 47·808 seconds. According to the present method the mean length of the year is 365·2425 days, which is slightly in excess of the Solar day. As this excess amounts to one day in about 3600 years, it may clearly be disregarded for the present.—*Clifford E. F. Nash.*

GOLD FISH.—A few weeks since, I had two gold fish in a small glass globe. Late one night I noticed one of them vainly trying to lift up a shell; I thought nothing more about it at the time. A few days afterwards I noticed it again trying to lift the shell up; putting my hand into the water, and lifting the shell up, one of them came slowly to the top—dead. A few days after, the remaining one died; whether from grief or not, I cannot say.—*W. R. Riley.*

THE SOLAR YEAR.—Your correspondent T. R. Jones has perhaps been misled by some inaccurate astronomical treatise, or perhaps by his own too-hasty reading. The year of 365 days 6 hours 9 min. 9·6 sec. is called the Sidereal Year, and denotes the period in which the sun completes his apparent course through the Zodiac, measuring his position with respect to the stars. It does not correspond to the Solar Year, or period elapsing between two vernal equinoxes, because owing to the sun's own motion through space, the position of the vernal equinoctial point is continually changing. The length of the true Solar Year is, I believe, 365 days 5 hrs. 48 min. 49·7 sec. Leap-year, therefore, is so far from failing to cover the whole deficiency in the length of the calendar year that it covers too much;

and a day will be omitted, not inserted, in the year 1900. The omission of the 29th of February in a leap-year is made three times in every four centuries. The recognition of this necessity was the celebrated Gregorian Reform of the Calendar, accepted by England in 1752—the non-adoption of which by the Greek Church accounts for the fact that Russia and Greece are now twelve days behind the rest of Europe.—*C. B. Moffat.*

SONG OF THE WAGTAIL.—Both the pied and the grey wagtail are among the songsters whose vocal powers often pass unnoticed: the same remark, I think, applies to the rich bell-like melody of the stonechat, and the inward warble of the spotted fly-catcher. In my experience all these birds sing for a very short season in spring, resuming their notes (with perhaps the exception of the stonechat) for a few days in autumn. The pied wagtail's song is not always "subdued"; at times it is so loud and shrill as to recall rather the canary than the robin-redbreast. —*C. B. M.*

MIGRANTS AND HIBERNANTS, 1891.—The swift seen by Mr. Law on November 13th (as noted in SCIENCE-GOSSIP for January), was, I think, unprecedented; but there seems to be ground for believing that the swift as a species has lengthened the period of its sojourn with us since the time of Gilbert White, who in 1767 remarked that these birds "leave us before the middle of August invariably." At Oxton, in Cheshire, swifts last year continued numerous and ubiquitous until September 5th, on which date I altogether missed them; stragglers may have stayed behind, but I saw none during the few days longer that I remained in the neighbourhood. It will be remembered that White drew a comparison between the swift and the great bat (*Noctula altivolans*), which last, he said, "retires or migrates very early in the summer," adding that he saw them most commonly in June, but never after July. At Lyndhurst, in the New Forest, however, I saw a group of these large bats hawking on the evening of the 23rd of August last, a sight that would probably have somewhat surprised the old naturalist. I doubt not that similar appearances are frequent enough, and many correspondents of SCIENCE-GOSSIP have perhaps seen the bat later; but never having been in the haunts of that animal myself except for one delightful fortnight last summer, I think it is as well to note the fact of its appearance on August 23rd. Of creatures supposed to be more or less dormant at the present season, I may mention having seen a wasp on the wing on the 16th of December, a frog (only half awake) attempting to struggle across a grass-field on the 29th, and a spotted slug (*Limax antiquorum*, I think) in full activity on the last day of the year. Of the partial nature of squirrels' hibernations, the following observations during the week following Christmas Day may afford some evidence. I saw here—in woods at Ballyhyland, Co. Wexford—one squirrel on the 26th of December, three on the 28th, two on the 31st, and two more on the 1st of January. Of these eight, two were probably appearances of the same animal on different days; but I am pretty sure that I saw seven different squirrels during the week. These were all feasting on the growing cones of larch and pine, so that evidently they have no need as yet to resort to their winter hoard, if they really possess anything of the kind. The season, though not severe, has not been exceptionally mild; and the food-supply on the trees, far from being particularly abundant, is less than the average.—*C. B. Moffat.*

BRITISH ORTHOPTERA.—As I contemplate writing a popular handbook on the above as a companion volume to my "Illustrated Handbook of British Dragon-flies," I shall be very glad to communicate with all who are interested in these insects. Local lists and specimens for figuring would be very acceptable.—*W. Harcourt Bath, Ladywood, Birmingham.*

BRITISH DRAGON-FLIES.—Will readers who are interested in the above kindly supply me with local lists of same, as I am desirous of elucidating their distribution in this country?—*W. Harcourt Bath, Ladywood, Birmingham.*

PAPERS ON FLINTS.—Being much interested in the subject of flints, the cause of their peculiar deposit in the chalk, and their formation in this and other strata, I should be glad if any of your readers could direct me to any recent papers or books referring to this form of silex, or to any specimens of siliceous sinter, concretional flints, or anything else likely to help. I find it difficult to obtain such from the dealers, or would not trouble you.—*G. Abbott.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

TO ANONYMOUS QUERISTS.—We must adhere to our rule of not noticing queries which do not bear the writers' names.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply DISGUISED ADVERTISEMENTS, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges," which cannot be tolerated.

WE request that all exchanges may be signed with name (or initials) and full address at the end.

SPECIAL NOTE.—There is a tendency on the part of some exchangers to send more than one per month. We only allow this in the case of writers of papers.

TO OUR RECENT EXCHANGERS.—We are willing to be helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

F. G. BING.—If not too large or heavy, send us your specimen for identification, with stamps to cover expenses of return.

I WANT to procure the reed meadow grass (*Glyceria aquatica*). Will any reader of SCIENCE-GOSSIP kindly let me know where it is grown?—S. C. Hincks.

J. BOGGUST.—Accept our best thanks for the beautiful mount of tongue of privet hawk moth. We are pleased to call the attention of our readers to your method in our microscopical column.

W. MACKIE.—Messrs. Allen & Co., Waterloo Place, London, purchased Mr. Bogue's stock, including, we believe, the "Catalogue of British Mosses." We are of opinion it is now out of print. Wheldon's "Catalogue of York Mosses" would serve your purpose. Why not get Hobkirk's "Synopsis of British Mosses," latest edition? It is more expensive, but will serve for life as a handbook, giving structural characters, localities, &c. We are surprised that publishers of these and similar works do not advertise more in our columns, as we are constantly being asked about them.

EXCHANGES.

WILL send collections of two hundred named specimens (sixty species) Victoria shells, in return for same number named recent shells of any other country.—F. L. Billinghurst, National Bank of Australasia, Castlemaine, Victoria, Australia.

WANTED, correctly named British land and freshwater shells, to start collection. British birds' eggs or dried British plants, many rare—*Carex irregna*, *Utricularia minor*, &c.—in exchange.—J. Corrie, Moniaive, N.B.

Machaon betulæ, Paphia polychloros, Sylvanus hyper-

anthus, *Corydon galathea*, *Ligustri caja*, *Dispar chy.*, *Betularia vinula*, *Silago lanestris*, *Jacobæ pudibunda*, and others, for side-blown birds' eggs, one hole.—F. J. Rasell, 61 St. James Road, Northampton.

WILL anyone help me to obtain some male crickets (*Acheta domestica*), say, three or four dozen or more? I will arrange with correspondents about exchange.—A. Witt, Hale Rectory, Salisbury.

A FEW novels (Kingsley's, Scott's, &c.) to exchange for geological specimens correctly named, and with locality, &c. List on application.—Walter C. Shields, 36 Garturk Street, Crosshill, Glasgow.

WANTED, any fossils not in my collection, also violin, clarionet, microscope, &c. Exchange photos of locomotive engines (including Stephenson's "Puffing Billy," Hedley's, and Treverick's engines).—Reginald E. M. Bleasdale, 104 Dale End, Birmingham.

OFFERED, minerals, fossils, shells, micro. objects and material, Devonian polished and rough corals and sponges, and rock specimens, as quartzites, quartz royalites, Murchisonites and granites, and other porphyretic specimens, in exchange for any of the following: good microscope with accessories, telescope, opera glass, secondhand watch that will keep time, or a collection of stamps in album, or any of the following shells:—*Vertigo Moulinsiana*, *V. pusilla*, *Isocardia cor*, and *Limnæa involuta*. Good exchange guaranteed.—T. E. Sclater, Northumberland House, Teignmouth.

A LARGE number of school and text books offered in exchange for fossils, shells, rocks, minerals, or slides. The subjects embrace Greek, Latin, French, German, science, divinity, history, geography, mathematics, and English. List of any subject from—Mr. A. E. Salter, 8 Venetia Road, Finsbury Park, N.

OFFERED, a complete set of entomological apparatus, including setting house with perforated zinc door, ten setting boards and drawer for pins; also collecting tin store boxes, &c. Will sell cheap, or exchange for good trout rod.—W. C. Wright, Lauriston, Derrievolgie, Belfast.

OFFERED, variety of specially mounted first-class micro. slides for oxyhydrogen microscope. Desiderata, foraminifera, polycistina, diatoms, sponges, &c.—H. W. Case, F.R.M.S., Cotham, Bristol.

WANTED for a museum, a few cut and polished ammonites in halves or pairs, not less than six inches in diameter—larger ones preferred—for which I shall be pleased to send in return thirty nice named specimens of minerals (not rocks) from Devon and Cornwall. Also wanted, large fossil ammonites, unpolished, from the district in Yorkshire where they are plentiful, and other large fossils and large minerals of crystallisation, or any of the following books:—Tate's "Land and Freshwater Molluscs," Turton's "Manual of the Land and Freshwater Shells of the British Islands," Reeves' "Land and Freshwater Molluscs," in exchange for fossils, British and foreign shells, rock specimens, micro. objects, and Devon corals.—A. J. R. Sclater, M.C.S., Natural History Stores, 43 Northumberland Place, Teignmouth.

OFFERED, *Bythinia tentaculata*, *B. Leachii*, *Hydrobia ventrosa*, *H. Jenkinsi*, *Valvata piscinalis*, *V. cristata*, *Planorbis corneus*, *Physa hypnorum*, *Limnea glutinosa*, *Succinea putris*, *Hyalina cellaria*, *Helix arbustorum*, *H. cantiana*, *H. rufescens*, *H. pisana*, *H. virgata*, *H. virgata* var. *submaritana*, *H. ericetorum*, *Pupa umbilicata*, *Clausilia rugosa*, &c. Wanted, other land and freshwater shells not in collection.—C. Baldock, 21 Chapel Street, Woolwich.

WANTED, European dragonflies, British locusts, field cockroaches, male crickets, field crickets, British hawk moths and British mammals (stuffed or in the flesh), particularly bats, wild cat, marten, polecat, otter, badger; also varieties of common species. Offered, natural history books and pamphlets, British butterflies, dragonflies, land and freshwater shells, marine shells, and geological specimens; also small cabinet suitable for eggs, shells, &c.—W. Harcourt Bath, Ladywood, Birmingham.

WANTED, good illustrated works relating to European odontata, orthoptera, and rhopalocera, also first-class aneroid barometer, and combined opera and field-glass. A good return will be made in natural history books or specimens, &c.—W. Harcourt Bath, Ladywood, Birmingham.

DUPLICATE clutches of sooty tern, golden-winged woodpecker, little grebe, mute swan, moorhen, bullfinch, pied wagtail, Manx sherewater, tits, and others, side-blown and with data. Wanted, turnstone, divers, ducks, and offers.—F. W. Paple, 62 Waterloo Street, Bolton.

WANTED, British or foreign shells or fossils, in exchange for others. Foreign correspondence specially desired.—Rev. John Hawell, Ingleby Greenhow Vicarage, Middlesbrough.

DUPLICATES.—A large number of correctly named and perfect specimens of British coleoptera, also a few hemiptera, and a few land and marine shells. Desiderata, lepidoptera, coleoptera, and other orders, and named types of British and foreign shells, or offers.—A. Ford, Claremont House, Upper Tower Road, St. Leonards-on-Sea, Sussex.

WANTED, L. C., 8th ed.:—21, 22, 27, 45, 143, 155, 193, 259, 354, 368, 402, 405, 459, 470, 492, 533, 559, 611, 626, 634, 676, 700, 726, 729, 739, 789, 805, 875, 879, 885, 898, 1011, 1025, 1040, 1043, 1045, 1115, 1351, 1380, 1606, 1771, 1800, &c. Send complete desiderata to—H. Fisher, Stodman Street, Newark, Notts.

WANTED, bound volumes of "Great Thoughts," novels by J. M. Barrie, Thomas Hardy, or "Q." Good exchange given in fossils and minerals from all formations.—James Marsden, 3 Schleswig Street, Preston.

WANTED, minerals or fossils in exchange for carboniferous fossils or emu's eggs. Address—John Millie, Echobank, Inverkeithing, Fifeshire, N.B.

BIRDS' eggs. Duplicates of red grouse, puffin, lesser redpole, sandpiper, black-headed bunting, whinchat, yellow wagtail, &c. Desiderata, swift, hobby, merlin, barn owl, buzzard, and many others.—W. G. Clutten, 19 Berkeley Street, Burnley.

OFFERED, *Pis. amnicum*, *Pal. vivipara*, *Byth. tentaculata*, *Plan. carinatus*, *H. nemoralis*, *H. hortensis*, *H. arbustorum*, *Bul. obscurus*, *Vert. pygmæa*, *Coch. tridens*, in exchange for British land and freshwater shells not in collection; also for foreign shells. Foreign correspondence invited.—H. E. Craven, Matlock Bridge.

WANTED, fossils from the London clay, Woolwich and Reading, and Thanet sands. Good exchange given from other strata.—T. W. Reader, 171 Hemingford Road, Barnsbury, London, N.

WANTED, minerals and terebratula in exchange for eocene fossils, Cornish metallic minerals, and rock specimens.—E. H. V. Davies, 46 Upper Belgrave Road, Clifton, Bristol.

THE following numbers of SCIENCE-GOSSIP, clean and perfect—Nos. 73, 119, 151, 173–178 inclusive, 220, and 253. The lot for 5*s.* 6*d.*, post free, or any single number sent by post for 7*d.* each.—H. Allingham, The Mall, Ballyshannon, Ireland.

OFFERED, microscopic objects—entomological, polar, &c.—three dozen professionally mounted. Wanted, fly-rod, tackle, &c., or books.—G. Barker, 24 Avenue Villas, Cricklewood, N.W.

OFFERED, "The Microscope," by Hogg (sixth edition), Davies' "Practical Microscopy" (second edition), and Balfour's "Manual of Botany," all in good condition. Wanted, volumes of SCIENCE-GOSSIP, bound or unbound, for 1867, 1870–1872, 1875, 1876, 1878–1881, or works on cryptogamic botany.—W. P. Quelch, 8 Eccleston Road, Ealing Dean, London, W.

WHAT offers for SCIENCE-GOSSIP for about twenty years, also last edition of "Micrographic Dictionary"?—A. Draper, 179 Cemetery Road, Sheffield.

FOR exchange, *Plan. complanatus*, *Zonites cellarius*, var. *albinos*, *Z. glaber*, *Z. nitidulus*, *Helix nemoralis*, *H. hortensis* and var. *lutea*, *H. arbustorum*, *H. rufescens*, *H. hispida*, *H. virgata*, *H. ericetorum*, *H. rotundata*. Wanted, *Limnæa*, vars. *limax*, *succinea*, *vertigo*, &c., or offers.—A. H. Shepherd, 81 Corinne Road, London, N.

WANTED, a few good specimens of malachite and rock crystal; must be in crystals. Will give Alston Moor minerals in exchange.—William Hetherington, Nenthead, by Carlisle.

OFFERED, *Xylophaga dorsalis*. Wanted, *Terebratula cranium*, *Argiope* (all), *Anomia striata*, *Pinna nudis*, *Lima Loscombii*, *L. Sarsii*, *Modiolaria nigra*, *Nucula sulcata*, *Limopsis aurita*, *Arca obliqua*, *A. pectunculoides*, *Lepton* (all), *Axinus crouliensis*, *Diplodonta rotundata*, *Cardium aculeatum*, *C. nodosum*, *C. nod.* var. *papillosum*, *Astarte* var. *elliptica*, *Tapes*, var. *sarniensis*, *Tellina balaustiana*, *T. pusilla*, *Psammobia costulata*, *Donax politus*, *D. trunculus*, *Donax* var. *magna*, *Lutraria oblonga*, *Trochus amabilis*, *T. Dunningi*, *T. montacuta*, *T. occidentalis*, *T. striatus*, *Littorina neritoides*, *Scalaria Trevelyana*, *Ianthina*, *Natica Islandica*, *Velutina plicatilis*, *Trophon muricatus*, *Fusus Norvegicus*, *F. Islandicus*, *F. propinquus*, *F. buccinatus*, *F. Berniciensis*, *F. fenestratus*.—J. Smith, Monkredding, Kilwinning.

BOOKS, ETC., RECEIVED FOR NOTICE.

"The Realm of Nature: an Outline of Physiography," by Dr. H. R. Mill (London: John Murray).—"Power and Force, Spiritual and Natural," by J. B. Keene (London: T. Fisher Unwin).—"An Account of British Flies," Part 3, Vol. 1, by F. V. Theobald (London: Elliot Stock).—"The Microcosm," Nov. (New York).—"The Entomologist's Record," No. 12, Vol. 2.—"Manipulation of the Microscope," by E. Bausch (London: W. P. Collins).—"The Collector's Monthly."—"Gentleman's Mag."—"Midland Naturalist."—"American Naturalist."—"American Microscopist," &c., &c.

COMMUNICATIONS RECEIVED UP TO THE 12TH ULT. FROM: J. M.—H. E. C.—W. G. G.—R. A. P.—T. W. R.—J. G. E.—E. H. V. D.—M. A. A.—A. D.—A. H. S.—H. S. A. A.—G. B.—W. P. Q.—H. A.—A. J. H.—J. M.—W. H.—W. A.—H. G. W.—D. R.—W. M.—J. B.—A. J. T.—T. D. S.—A. F.—H. F.—J. M.—J. E. T.—G. A.—J. H.—J. W. P.—C. B. M.—J. E.—J. C.—T. L. B.—C. H. J. B.—W. B. H.—R. E. M. B.—H. W. C.—A. E. S.—T. E. S.—A. J. R. S.—W. C. S.—W. C. W.—F. J. R.—S. C. H.—J. C.—F. G. B.—H. G. W. A.—A. G. T.—E. E. G.—C. E. T. N.—A. B.—T. B.—A. E. B.—R. F.—T. S. B.—S. C. S.—&c., &c.

THE BRITISH PERLIDÆ OR STONE-FLIES.

By W. H. NUNNEY.

[*Continued from p.* 39.]

IT will be seen from the table (p. 38) that the British Perlidæ may primarily be divided into three sub-families:—PERLINÆ, including those genera in which the species have setaceous palpi and long tail-bristles—CAPNIINÆ, the species of which possess filiform palpi and long tail-bristles—and lastly NEMOURINÆ, including all species with filiform palpi and tail-bristles which are merely rudimentary or are entirely wanting. Some systematists may possibly raise objections to such a division of the family, but I am convinced that the distinctions between the groups I have named are something more than mere generic ones. Not, however, having space at my disposal in which to enter at length into my reasons for such belief, I will now proceed to give notes relating to the various species mentioned in the synopsis.

Dictyopteryx microcephala, Pictet. This insect appears to be widely distributed. It is common in the south of England, and in Ireland, and is found somewhat sparsely in Scotland. It frequents the borders of streams from early spring until autumn.

The wing venation is not constant, the cross-veins beneath the costa especially varying in number in individuals. In a specimen in my own collection, the left upper wing has only five cross-veins, whilst the right upper wing has eight. In Pictet's drawing of this species, in Vol. 26 of the "Annales des Sciences Naturelles," he shows seven sub-costal cross-veins. The size also varies slightly, the average length of the body with the wings closed being nine lines, and with the wings expanded, one inch five lines. The wings are considerably shorter in the male than in the female.

Dictyopteryx rectangula, Pictet. This species has the wings somewhat broader and of a darker tint, with very dark nervures. It is rather common, and widely distributed in the south, along the banks of streams in June. Its length is nine lines, wing expanse one inch four lines. It differs from microcephala in its smaller size, the greater width of the hinder margin of the prothorax, and the slightly different reticulation of the sub-marginal region; in microcephala the cellules are small, irregular, hexagonal or pentagonal, whereas in the present species they are rectangular.

Isogenus nubecula, Newman. This insect, the only European species of the genus, is a connecting link between Dictyopteryx and Perla, and Perla and Chloroperla. It is found in the neighbourhood of running water, and is apparently widely distributed, except towards the north, where it is somewhat scarce. This species is easily distinguished from allied species of other genera by its wings having a small oval dark-brown spot on the costal margin, about two-thirds of the distance from the base to the tip. Length nine lines; wing expanse fifteen lines. The male is less in size than the female. It appears in April.

Laboulbène states that specimens of this species, when laid upon their backs, remain perfectly motionless, excreting at the same time a yellowish liquid at the joints of the legs.

Perla maxima, Scopoli ("the stone-fly" *par excellence*). In point of size this species and the one following run very close, but maxima is generally considered to be somewhat the larger, some specimens measuring nearly three inches across the expanded wings. The usual length is about twelve lines, the wing expanse in the female being about two inches eight lines, and in the male about one inch nine lines. The wing nervures are very dark.

As regards the present species, Dr. Brandt has raised a point of great interest to biologists. After having noticed rudimentary ovaries, etc., in a male larva, he was greatly astonished to observe the same structures in a male imago, from a different locality. He asks, can he have observed only a monstrous individual in each case, or is rudimentary hermaphroditism a rule with the species?

Perla marginata, Muraldt. Individuals of this species are found of large size. One specimen in the British Museum measures two inches eleven lines across the expanded wings. The length is usually about eight lines, and the wing expanse (♀) about two inches. The measurements of the male are much less, the wings being often atrophied. The male is generally lighter in colour than the female, but the markings vary but little. Both sexes are fairly common along the banks of streams at the end of spring. The Rev. J. G. Wood says: "The egg cluster of this species is as large as a swan-shot, and nearly as black." According to Curtis, the cast pupa-skin is beautifully spotted.

Perla cephalotes, Curtis. This insect is remarkable for the extreme disproportion that exists between the male and female; moreover, the wings in the male are reduced to mere rudiments. This species is somewhat like the last, both in size and colour, though ♂ specimens of marginata usually have the wings long. The colour of the prothorax will separate them. It appears in summer.

Chloroperla rivulorum, Pictet. This species is to be distinguished from the next by the generally distributed brown tint, by the head being brown in the middle, with a well-marked blotch in the form of a horse-shoe. Appears in summer by the sides of mountain streams. Transformations unknown.

Chloroperla grammatica, Poda. Mr. Parfitt says of this insect, "Very abundant along our rivers and streams (in Devonshire) from May to October. It varies greatly in size and colouring, so as to lead one to think that there are two or three species collected under one head." Of these varieties, the reddish rufescens is the most aberrant. This species also bears a horseshoe-shaped blotch on the head, but it is isolated. The palpi are prominent. The imagines emerge in April, and are widely distributed.

Isopteryx torrentium, Pictet. Somewhat rare; frequents wood-stacks; emerges about May. Larva and pupa unknown.

Isopteryx Burmeisteri, Pictet. Abundant in the north "by the side of every water" (Mr. J. F. X. King); common in Ireland; probably mixed in cabinets with *I. tripunctata*.

Isopteryx tripunctata, Scopoli. Smaller than the preceding. The palpi are very prominent. This is the "yellow Sally" of anglers. Larva unknown.

Isopteryx apicalis, Newman. The smallest species of the genus. The palpi are very prominent. Larva unknown.

Capnia nigra, Pictet. There is a record in the "Canadian Naturalist," of enormous numbers of this species appearing on the snow on the Rivière du Loup, Canada, in the month of March a year or two ago. Bethune, also, in the "Canadian Entomologist," speaks of the occurrence every spring, of swarms of this small perlid on the River Crédit, in Canada, and of its frequently being found on the surface of snow. I believe the same thing occurs to some extent in Scotland.

This species, the only British one of the genus, rolls its wings into a half-cylinder around its body, thus mimicking certain Nemouræ. It is difficult to capture without damaging it in some way. It flies but seldom, and then swiftly for short distances among the stones at the water's edge. It is apparently confined to northern limits, and does not seem to occur in Britain in any great numbers.

Tæniopteryx nebulosa, Linné. This is the largest of the known species of the genus. Anglers have named it the "red upright." Parfitt, speaking of this species in Devon, says, "very scarce." He also writes, "The larvæ of this species live among the stones, of which the weirs on the Exe are built, and where the water rushes over with great force. When about to undergo the last change, or rather the emergence of the imago, the subimago creeps up the wood-work of the weir or the sluice-gates, and grasps the wood very firmly, with its legs outstretched, and the sharp claws of the tarsi firmly pressed into the wood. The head is first ruptured; the skin then parts along the back from the pressure within, as far as the base of the wing-cases; the insect gradually emerges, leaving its old skin to dry on the wood-work. The difference in the colouring in the subimago and the perfect insect is very striking. In the former, it is shining black-brown. The face is ornamented with a white mark in the form of a Greek or an Egyptian vase, having two curved cornutæ for the handles, mouth white, with ferruginous jaws, antennæ yellow. The thoracic region is maculated with white, the tips of the wing-cases are whitish; the abdomen has two rows of angular white spots on each segment, setæ pale yellow, legs whitish, femora dusky beneath. All the tibiæ, and especially the posterior, are provided with a row of long ciliæ on the outside, to assist them in swimming." The

femora in this species are wholly blackish. The bands on the wings partially disappear after the death of the insect. The females of this species, which appears during the spring, are usually found with a glutinous egg-cluster at the extremity of the abdomen.

Tæniopteryx trifasciata, Pictet. Palpi very prominent. Femora blackish only at the extremities. Of this insect, Parfitt remarks, "This very distinct and apparently rare species I captured by Exwick Weir (Devon). The fasciæ on the wings are very distinct when the insect is fresh. The posterior wings have a beautiful delicate purple tint, except along the anterior edge, where it is, as Mr. Stephens remarks, 'fuscescent.' The body and legs vary a good deal in colour, from reddish yellow to pitchy black."

The females of this species appear more often met with than are the males. The pupa undergoes a slight change when it nears the time for becoming an imago. The thorax becomes rounded instead of square; the body tapers more, and the wing rudiments, previously yellowish, become deeper in colour, as does the entire body.

Leuctra geniculata, Stephens. This appears to be widely distributed; it is taken somewhat sparsely in the south, but it is very common at many places in the north. It may be looked for in June. The wings are generally rolled round the body in a half-cylinder. Mr. McLachlan has recorded in the "Entomologist's Monthly Magazine," his having observed a female of this species carrying her eggs upon the back of her abdomen.

Leuctra fusciventris, Stephens. This species also rolls its wings in a semi-cylinder. It is, at times, found on flowers in fields. It may be taken in June and July, and, although somewhat uncommon in the south of England, is abundant in the north. The larva of this species has no respiratory sacs.

Nemoura variegata, Olivier. This is, perhaps, the most common of our stone-flies, appearing from April to August. Anglers call it the "willow-fly." True to its specific name, it varies greatly in colour, specimens occurring even of a reddish hue; these latter form the variety Fuliginosa. The larvæ, in which respiratory sacs are not visible, are found both in stagnant and running water.

Nemoura Meyeri, Pictet. The male and larvæ are unknown. Rare.

Nemoura nitida, Pictet. This, the largest of the genus, is a very pretty species, the wing nervures being edged with yellowish-grey. It seems confined to the north, the larvæ frequenting mountain rills. These larvæ have respiratory sacs. Rare. March to October.

Nemoura cinerea, Olivier. As regards colour this is the most variable species of the genus, and much confusion has arisen on that account. It is common in the north in May.

Nemoura humeralis, Pictet. This species is distinguished from all others by the contrast of the almost opaque colour of the wings and the light colour of the feet. It is, however, sometimes confounded with *N. cinerea*, which has the prothorax wider than long. Common in the north in May. Larva unknown.

Nemoura sulcicollis, Stephens. Generally distributed. June to October. Larva unknown.

Nemoura inconspicua, Pictet. This is the most minute species of the group. Its pale colour persists throughout its life. The larva bears thoracic respiratory sacs. Rare.

The foregoing species being enumerated, I have nought to do but to draw speedily to a finish.

In this short paper, no attempt could be made to treat the subject exhaustively, or even to give a full description of each species, and indeed the present contribution is but a series of notes on the known British species of the family. However, as I fully recognise its defects, I hope to remedy them at some future period, by the publication of a series of articles in some other periodical entirely devoted to the consideration of entomological subjects.

A few words as to the best books and papers treating of the Perlina. These are:—By Pictet: "Histoire Naturelle de la Famille des Perlides"; Paper in the "Annales des Sciences Naturelles," 1833, (Zoological section); Paper in the "Mémoires de la Société de Physique et d'Histoire Naturelle de Genève," vol. vii. By Stephens: "Illustrations of British Entomology," vol. vi., Mandibulata. By Newman: "Magazine of Natural History," 1839; "Entomological Magazine," vol. iv., 1837. By Burmeister: "Handbuch der Entomologie," ii. By Curtis: "British Entomology." By Brauer: "Neuroptera Austriaca," 1857. By Rambur: "Histoire Naturelle des Insectes Névroptères," 1842. By Walker: "Catalogue of Neuropterous Insects in the British Museum," Part I., 1852. (Descriptions in Latin.) For other references the student should obtain the "Catalogue of British Neuroptera," published by the Entomological Society of London, in 1870.

In conclusion, I may say that I shall be pleased to help anyone, by naming specimens or giving other information relating to the Perlina.* I shall also be very glad to receive contributions of insects of this group for my own cabinet, with the usual data relating to place of capture, etc., from which to gain a better knowledge of the distribution of the Perlina in the British Isles. Communications may be addressed to me, at 29, *St. Philip's Road, Dalston, London, N.E.*

* All specimens should be sent securely packed, and the address written on a label *fastened to the string* with which the package is tied. In the case of an answer, or insects being required to be returned, stamps sufficient to cover postage should be sent to me.

NOTES ON AMŒBA AND INFUSORIA.

By Bernard Thomas.

I.—The Amœba.

THE Amœba is often chosen as a type of the animal cell. It is a single cell without modifications. For this reason and also because its study is, perhaps, the best introduction to the Infusoria, it is here introduced.

The Protozoa forms the lowest group of the animal series, and correspondingly the Protophyta that of the plant series. These two groups, although differing in some ways, resemble each other in several other particulars, so that it may be doubtful in which kingdom to refer a particular organism. Thus we may draw a letter U, one limb of which represents the vegetable and the other the animal kingdom, while the connecting piece, in like manner, represents the unicellular organisms common to both. Professor Häckel's Protista* was intended to include that class of organisms intermediate between the two large biological kingdoms, but it unfortunately included multicellular as well as unicellular forms.

The Amœba (Fig. 25), the Protean animalcule, is to be found in almost all collections of ditch or pond-water, and when a familiar object the microscopist has usually not long to search for it. To those who have never seen it, it may be mentioned that it can usually be found in the water where dead flowers have been left to stand. With a fair instrument, and a magnifying power of two or three hundred diameters, its form and movements may be readily examined.

In size it varies, some specimens may be so large as to be visible to the unaided eye, but this is by no means common, and others, again, require a power of three hundred diameters before they can be observed with any satisfaction. Its very irregular outline is constantly changing (Fig. 25 *b*). The general substance (described as protoplasm) is transparent, colourless and in places more or less granular. Sometimes it contains spaces filled with a more fluid material or with food, consisting of organisms, etc., it has "swallowed." Usually one of these spaces is contractile and known as the *contractile vesicle*, and somewhere in the protoplasmic mass a roundish body, the *nucleus* or *endoplast*, is to be distinguished.

The protoplasm may be divided into two areas; an internal, more granular *endosarc*, and an external, more hyaline *ectosarc*. The appearance may be compared to that of ground glass, fine in the former and coarse in the latter region. Some Amœba are more hyaline throughout, others more granular.

The semi-fluid nature of the protoplasm is best understood by observing the formation of the pseudopodia or processes which the Amœba ever and anon thrusts forth. This phenomenon takes place in the following order:—

(1.) A bulging of the ectosarc.

(2.) The granules of the endosarc run rapidly into the process so formed.

Sometimes, however, only the first part of this process is performed. The more fluid part of the protoplasm is the internal endosarc, and its fluidity is demonstrated by the quicker performance of the second stage than of the first.

Apart from the formation of pseudopodia, however, there are movements constantly visible in the endosarc, which may be described as a kind of rotation similar to, but not so regular as, that seen in certain vegetable cells.

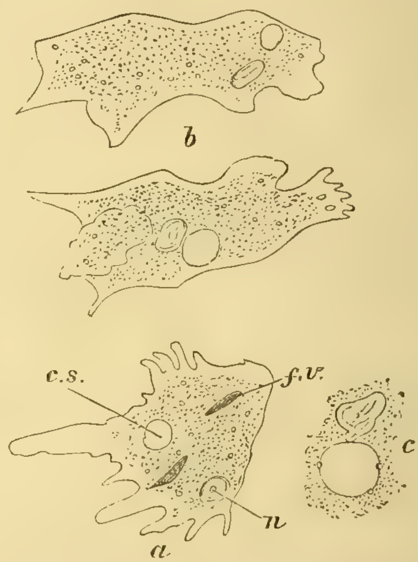

Fig. 25.—*a*, Amœba, showing contractile space (*c. s.*), nucleus (*n.*), food-vacuoles (*f. v.*), and pseudopodia. The endosarc is clearly marked from the ectosarc; in the latter granules are seen. *b*, Amœba, showing change of form after a few seconds. *c*, nucleus and contractile space very highly magnified.

With respect to the granules, these seem to be of two kinds, either coarse with well-defined outline, or small and faint. The presence of the latter is explained by the theory that the protoplasm is a delicate network with a fluid substance filling its insterstices. The strands of the network are neither rigid nor constant, and it must not be supposed that they are arranged with any regularity. In places their absence is denoted by a vacuole, and the junction of the meshes by a granule (node). The contractile vesicle, if observed for any length of time, is seen to expand and contract. It has been supposed by some to represent a heart driving the fluid in all directions through the organism. It may be, perhaps, a rudimentary respiratory organ, by which the aeration of the protoplasm is brought about. But at present its function is uncertain, and it may simply be a mani-

* Häckel's Protista: i. Monera; ii. Flagellata; iii. Labrinthula; iv. Diatomeæ; v. Phycochromaceæ; vi. Fungi; vii. Myxomycetes; viii. Protoplasta; ix. Noctiluca; x. Rhizopoda.

festation of the changes in the protoplasm or of the movements that are seen to take place within the organism. In some Amœba this organ appears to be absent.

The nucleus is not always easily seen in the Amœba, in some specimens none is discoverable, but when present it is seen to differ but slightly if at all in the refractive power of the general protoplasmic substance. It is provided with a delicate membrane and internally is composed of a network, called intranuclear and somewhat similar to that of the general protoplasm. The nucleus (with few exceptions) is present in every cell, and plays an important part in the process of reproduction. It divides previously to the cell in simple asexual reproduction, and in the sexual method fusion of the two nuclei takes place.

This short account of the morphology of the Amœba leads us to consider, briefly, what is known of the physiology of this interesting organism.

The problem of how to introduce into its interior the food on which it subsists is answered by the Amœba readily and simply. At any part of its surface the food may enter; the protoplasm flows round it, slowly engulfs it, and thus produces a food vacuole directly in contact with the protoplasmic substance. The digestion apparently without the aid of gastric juice, without, as far as we know, any special ferment for converting insoluble into soluble substances, is hard to understand. And we reach a very difficult problem in physiology when we try to solve how the matter is absorbed and converted into living material. In our own bodies the gastric juice and other ferment-containing substances are required to bring food directly in contact with the protoplasm of the cells of which we are built up ; but here we have food directly in contact with endosarc, dead protoplasm in contact with living ; and yet, though we have reached the most primitive form of assimilation in the animal kingdom, we are at a loss to explain how it takes place. I have previously mentioned the contractile space and its supposed function, and the movements of protoplasm visible in the endosarc as well as the formation of pseudopodia by which locomotion is effected.

We must consider the whole substance of the Amœba capable of performing the various functions of life ; and this teaches us an important lesson, that in spite of the absence of differentiation, nevertheless the cell is enabled to perform its various functions, and this we shall see later is not the case among the Infusoria.

The eminently contractile nature of the protoplasm and its response to electrical, thermal and mechanical stimuli give us, perhaps, the first indication of a nervous and muscular system. The apparently purposeful movements of the Amœba, and still more of the higher Infusoria, their behaviour when they meet an obstacle or food, makes us almost fancy that they have at least the sense of touch and the will to act on that sensation. This may only be, however, the reaction of the protoplasm to a stimulus, non-intelligent, the result of a law due to the complex nature of the substance. Protoplasm is so complex, indeed, that in spite of the great advance of chemistry within recent years, we are unable to form an estimate of its composition. We know that the chief elements that compose it are carbon, hydrogen, nitrogen, oxygen, and a little sulphur and phosphorus, besides traces of other substances, and we have to remain satisfied with that. How these are built up, it is impossible to ascertain accurately, perhaps because of their complex arrangement into several groups and sub-groups loosely connected, and certainly because of the great practical difficulty of examining chemically a living material.

This protoplasm is constantly being broken down and as constantly renewed. It resembles the cloud which clings to the mountain-top, remaining the same in form, but the individual particles that compose it ever changing.

The study of the protean animalcule is the study of protoplasm ; and now with this introduction we will turn our attention to some members of the large class Infusoria.

(*To be continued.*)

HUMOURS OF FOSSIL-HUNTING.

MANY of my readers, geological and otherwise, have doubtless in the course of their experience been frequently diverted by ideas, both curious and amusing, prevalent in regard to their particular fields of research, among those with whom they have come into contact as they sought for fossils, plants, or other objects of natural history ; but this is more particularly the case, I believe, with those who like myself have "woo'd the gentle fossil from his native rock." May I offer a selection of such as have come under my own notice, in the hope that the perusal may call up a smile to faces that are so generally weighted by nature's many-sided problems.

It seems hardly possible that in these enlightened days the existence of the fossils in the rocks should remain a mystery, yet in many benighted districts, where I am compelled to suppose the foot of the geologist has seldom trod, people may still be found to whom the riddle is quite insoluble, and who remain provokingly sceptical in spite of explanations, which very often they themselves have called for. Such an one it was who enquired of me if my specimens were not more likely the result of the Deluge, some of the "wicked fishes" in fact, that perished by that catastrophe.

A complete list of the names applied to fossils by the workmen in pits and quarries would form of itself an article of very considerable length: those given below are a few culled from the many. The heart-shaped Micraster is a "toad," a "snake's-heart,"

occasionally a "five-finger," and once I have heard it referred to as a "thunderbolt." The Galerites are "sugar-loaves," or "shepherd-crowns," and I have it on the authority of an old workman in a gravel-pit, that if done over with black-lead they are capital ornaments for the mantelpiece. The spines of Echinoderms are generally "rolling-pins," but sometimes "graters": Belemnites are "bolts," with "thunder" as an affix occasionally thrown in free gratis. Every variety of bivalve rejoices in one of two names, "cockle" or "oyster," although sometimes in the case of the former a distinction is drawn between the smooth and the ribbed. Palatal teeth are generally known as "slugs," on account of their resemblance to a brown wrinkled individual who may be seen wending his slimy way across the meadows after a heavy shower. Turritellæ and other spiral shells are known as "screws."

At a small seaport, the name of which is usually associated with oysters, the cliffs are formed of the London clay, and large masses of this deposit are annually brought down by the waves and carried out to sea. Many of the fossils from this formation may be found upon the beach, or upon the mud-flats left exposed at low tide, and conspicuous among them are numbers of reptilian teeth, the fangs of which are usually covered by a rounded nodule of hardened clay. With the natives these pass as "cramp-stones," and are said to be certain preventives of cramp, if worn about the person. Unfortunately there appears to be some difficulty experieneed in keeping them upon the person when bathing.

On one occasion, when hunting in a chalk-pit, I was accosted by a workman who had found several broken nodules of iron pyrites, and who also offered the original suggestion that they would look very nice under a glass case with some stuffed birds. The idea of stuffed birds as a background to a mass of iron pyrites struck me as being particularly happy, and not having been copyrighted, it is herewith offered to taxidermists and others, who may make any use of it that they think fit. At another time I had succeeded in disinterring from a gravel-pit lying within the outworks of an old Roman fort, a tile and several fragments of pottery, undoubtedly Roman, which I found associated with a quantity of wood-ashes, the remains apparently of an ancient camp-fire. Sceptical friends, however, suggested "a Roman dust-heap," (sarcasm vulgaris.) The family washer-lady having once seen me cleaning and mounting a number of chalk-fossils, informed a crony that I was "making little ornaments with pipe-clay." Hearing me refer to several specimens as Ammonites, caused a schoolboy to enquire if they "were the things that fought against the children of Israel in the desert." And so on, ad libitum. I should only exhaust your patience by multiplying examples, so with the following anecdote I will close. A geologist had been absent from home for several days on a fossil-hunting expedition, and on his return exhibited his specimens and narrated his adventures to a circle of friends, which included a native of Bedfordshire. None of his audience being acquainted with his favourite science, our geologist made a point of using the simplest language, and gave his account in the most lucid manner possible; but inadvertently falling into a style that was to him quite as familiar, he spoke of the formations he had been studying as "arenaceous deposits," immediately afterwards adding that he had meant "sandy beds." "Ah," exclaimed the Bedfordshireman, "Sandy, Beds; I know the place very well, I was born there." The point is obvious, but the moral requires searching out, and will probably be found in the paradox, that if you are not comprehended you are little likely to be misunderstood.

But I have said enough to show that the study of science may often be rendered less tedious by occasional meteoric flashes of humour, and the path to knowledge made pleasant and cheerful by a due appreciation of their value.

F. G. Bing.

NATURAL HISTORY RAMBLES ON THE S.E. COAST OF ENGLAND.

By A. H. Shepherd.

THE following notes are compiled with a view to assist young naturalists who may not as yet have visited the above locality. They are intended not so much to form a list of species actually taken at one time; but more as hints concerning such species as may be met with on the S.E. coast during the month of August. The district worked over extends from Ramsgate, by way of Sandwich, Deal, Walmer, and Dover, to Folkestone, and includes a considerable extent of the coast-line, with some variety of soil, producing its natural effect upon the botany of the district, and consequently upon the entomology also. All the places mentioned can be reached by rail, that is, within a reasonable walking-distance; therefore the young naturalist, whatever may be his hobby, has only to proceed to that part of the route which he thinks may be most remunerative in his own particular branch of study, and begin collecting on the spot.

Part I.—Ramsgate to Deal.

From Ramsgate to Pegwell Bay is a pleasant walk, but there is little, if any collecting to be done until the naturalist reaches the latter place, where, however, he may begin in earnest. If a conchologist, he may obtain, by searching the banks, roadsides, and broken ground, plenty of specimens of such species as *Helix nemoralis*, *H. virgata*, *H. ericetorum*, *H. caperata*, *H. cantiana*, and *H. aspersa;* this latter species I have met with in great numbers on the road-

sides after a shower of rain, but there did not appear to be a variety amongst them. A lepidopterist can do but little here, as only a few of the common species of butterflies and moths have been noticed; it is possible, however, that something might be done in Coleoptera.

Following the path along the top of the chalk cliffs, which gradually descend, we arrive at a place called Cliffs End, which is correctly named, seeing that at this place the cliffs do end, and we stand nearly on a level with the bay itself. If we retrace our footsteps a short distance, only this time walking along the beach, instead of upon the cliffs, we shall observe that the strata are here composed of a kind of sandstone, of the formation known as Thanet Sands, in which may be noticed a very interesting layer of fossil shells. They appear to consist chiefly of only two or three species, of which one, a species of Cyprinidæ, is by far the most common. From the loose and friable nature of the strata, it is almost impossible to obtain these fossils in a perfect condition. It is also to be observed that where masses of the strata in question have fallen upon the beach and become subjected to the action of the sea-water, they have been converted into a very hard stone, without any trace of the fossils, which are apparently dissolved by the same action which hardens the strata.

Turning our attention to the beach itself, the young collector may obtain many specimens of the more common species of marine shells, but these are unfortunately in most cases empty or dead shells. I am informed that the spring months are the best times in which to collect marine species round this part of the coast. However, there is plenty to occupy a young collector on this beach.

Returning to Cliffs End, we proceed to make our way round the bay. There is but little collecting to be done until we reach a point where the river Stour passes under the road to Sandwich; here we turn aside from the road, and crossing the river by a ferry boat, follow a path through the fields, which after a long and somewhat uninteresting walk, brings us to a part of the beach called Shellness, where the young conchologist may obtain a great variety of species of marine shells, some of them rather rare; the more common species are very plentiful. For a full list of the species to be taken here, I refer the reader to Mr. S. C. Cockerell's interesting paper in SCIENCE-GOSSIP for September 1883. Several species of Coleoptera may be obtained on the sands, in particular that rather local species *Cicindela maritima*, which sometimes occurs in considerable numbers, flying over and settling upon the hillocks of blown sand, through which the scanty grass and herbage makes its way. After proceeding a mile or more along the beach, the lepidopterist may enjoy some sport. By turning to the right he will find himself upon a wide expanse of nearly level ground, known as the "sand-hills," covered with coarse grass and various low-growing plants, where he may obtain several local species of moths, such as *Aspilates citraria*, *Eubolia lineolata*, and others, as well as the more common species of butterflies, such as *Lycæna agrestis*, *L. alexis*, *Hesperia linea* and others. After proceeding some distance to the right, the collector will reach a road or cart-track leading to Deal, on reaching which collecting ceases for the present. By following the track to Sandwich some good collecting in Lepidoptera may be done, in particular near the brackish drains or ditches where the herbage is most rank. Some local species of Coleoptera may be obtained here. The district near Deal has been, I believe, carefully worked of late years by several experienced lepidopterists, particularly of a night, with good results. The writer's ill-health has, however, prevented him obtaining practical knowledge as to the results of night-work; if, therefore, the young naturalist desires further information on this point, he is referred to several papers on this subject which have appeared from time to time in the pages of the entomological and other magazines. As regards botany there are many very interesting species to be obtained in this district; for lists of plants and other information, see SCIENCE-GOSSIP for 1880.

PART II.—DEAL TO DOVER AND FOLKESTONE.

After leaving Deal, the next good hunting-ground for the naturalist is Walmer, where much collecting may be done. The sloping chalk-banks on the right, which extend to the village of Kingsdown, are covered with various flowering plants, and on a fine day seem alive with various kinds of insects, comprising Lepidoptera and Coleoptera in fair proportion. Of the former, I have met with representatives of nearly every family, some of the species being local, such as *Liparis chrysorrhœa*, which flies freely at dusk, the larvæ web of the same being also found on the stunted hawthorn and blackthorn bushes. *Acidalia ornata*, *Aspilates gilvaria*, *Emmelesia unifasciata*, and many more. On the bedstraw (*Galium mollugo*), growing on the shingle, may be found the pretty larvæ of *Macroglossa stellatarum*, the "humming-bird hawk-moth." In conchology most of the same species of Helix as before mentioned occur here, with the addition of *Helix hispida* var. *nana* under low-growing plants, and *H. hispida* var. *albida*, once found in the web of a moth, *Liparis chrysorrhœa*.

On reaching Kingsdown the young naturalist will no doubt require rest and refreshment, and for this purpose he cannot do better than enter the "Rising Sun," which stands close to the road, and is therefore convenient for those whose excited feelings prompt them to run out every time they think they see a rarity fly by.

After leaving Kingsdown the cliffs begin to increase in height till we reach the coastguard station, near

which is a gap or opening in the cliffs. The collecting here does not differ much from that on the other side of Kingsdown, but *Gnophos obscurata* and *Melanippe galiata* are not uncommon, although rather local.

From the coastguard station the cliffs again rise, becoming as we advance more and more abrupt, and in some places rising to a considerable height. Great masses of chalk occasionally fall, blocking up the path and making the walking somewhat rough, but much good collecting may be done here—as before, mostly among the Lepidoptera and Coleoptera. The young botanist will, however, here find many small, but very interesting flowering plants; the yellow-horned poppy (*Glaucium luteum*) also occurs on the beach. The young lepidopterist, too, will find plenty of *Arge Galathea*, *Lycæna Corydon*, *Callimorpha dominula*, and *Aspilates gilvaria*, besides numerous other species more or less common.

The collecting along this portion of the route derives additional interest from the beauty of the surrounding scenery, having as we walk a fine view of the Channel and vessels of all sizes continually passing on the one hand, and the lofty chalk cliffs on the other.

As we approach St. Margaret's Bay, a fine view opens out of the cliffs and downs which extend from the other side of the bay towards Dover, the white tower of the lighthouse being just visible above the hills. If the young naturalist has had tolerable sport, he will be glad to rest and refresh himself when he reaches the "Green Man Inn," St. Margaret's Bay. Leaving St. Margaret's Bay and working directly over the Downs towards the lighthouse, the collecting does not differ much from that on the other side of the bay, except that in Lepidoptera several species are wanting here that occur there, while on the other hand a few, such as *Satyrus Semele* and *Eremobia ochroleuca* occur here more commonly.

The wind over the Downs is somewhat of a draw-back to the lepidopterist, taking the insects, as they rise, often quite out of the reach of the collector. I do not think there is very much collecting to be done near Dover, although such rare species as *Argynnis lathonia* and *Deiopeia pulchella* are sometimes taken, yet they cannot be counted upon.

MOSS-HAUNTING ROTIFERS; WITH DESCRIPTIONS OF TWO NEW SPECIES.

By Percy G. Thompson.

Within the last few years the attention of rotifer-workers has been directed somewhat specially to the numerous forms of Rotifera frequently met with amidst damp moss. These are often quite characteristic of such habitat, many of them are seldom or never met with from the more open conditions of ponds, ditches, etc., and it is scarcely an exaggeration to say that a veritable series of forms exists—a sort of rotiferous moss-fauna—eminently typical of this chosen place of abode.

Nor is it alone among aquatic moss, the Sphagnums and Fontinalis, that these moss-loving rotifers are to be found; quite a goodly number of species frequent the terrestrial Hypnums and other of the more delicate and feathery genera growing upon old tree-stumps, or upon damp ground, and manage to find sufficient water for their active existence in the slight film retained between the thickly-clustered leaves. A fragment of such growing moss, taken almost at random from a promising tuft, and placed in a trough with added water, will usually within a few minutes be found to be the home of several, perhaps many, distinct species of Rotifera.

Of the latter, it may be at once stated that a very considerable proportion belong to the Order Bdelloida, comprising those rotifers which (like *Rotifer vulgaris*) have a leech-like mode of locomotion by alternate elongation and contraction of the body, taking hold by turns with the head and foot at each stride. This predominance in numbers is, of course, related to the well-known power of resisting drought which the Bdelloids possess in such eminent perfection, and which must very often be called into requisition during dry weather, in the peculiar habit at which the moss frequenters have chosen. But not only Bdelloids, but also many of the true "free-swimmers" (Ploima), are of frequent occurrence under like conditions, and subject to the same variations in, or even temporary failure of, the supply of the important fluid.

Probably as a direct consequence of such vacillation in their water-supply, nearly all the forms of moss-haunting rotifera are of noticeably small size, and of comparatively insignificant, unattractive appearance, and in many cases require very considerable study, with high microscopic powers, to satisfactorily elucidate their specific characters. We do not get among them the fine handsome forms, the Brachions, or the Asplanchnas, or the Euchlanis, which love to rove at large in the infinitely greater waters of ponds; and perhaps for this very reason, and the difficulty experienced in making out their distinctive points, most workers at this class of animals have hitherto more or less avoided the study of the moss-dwellers. But it is just among these insignificant forms, that often will *not* fit in with the published descriptions so exactly as the observer could wish, that most work remains to be done in the determination of new species, and I need only refer to the recent articles in this paper by my friend Mr. Bryce, to show what is possible in this direction.

The following short list of Rotifera will serve to indicate those forms which, in my own experience, are most typical of the above habitats. Among damp terrestrial mosses and Jungermannia may be found *Macrotrachela constricta*, *M. elegans*, *M. musculosa*, *M. quadricornifera*, *Adineta vaga*, *Diglena*

mustela, *Stephanops stylatus*, *Monostyla arcuata*, and Mr. Bryce has even seen several impoverished-looking Floscules living under these, for a Rhizotan, remarkable conditions of environment. Amongst the water-loving Sphagnum are to be met with, in addition to the forms already mentioned, *Philodina macrostyla*, *Rotifer vulgaris*, *Macrotrachela Roeperi*, *M. reclusa* (these last two parasitic within the cortical cells of the Sphagnum-stems), *Notops hyptopus*, *Diaschiza pœta*, *Distyla flexilis*, *D. depressa*, *Monostyla lunaris*, *M. cornuta*, *Colurus caudatus*, and *Anuræa serrulata*.

With these introductory remarks, I proceed to the description of two new forms which have occurred to me from among terrestrial mosses during the past few months.

Macrotrachela multispinosa.

The genus Macrotrachela was instituted by Mr. Milne,* to include those three-toed Callidinæ in which, besides the general absence of eye-spots, the whole of the post-intestinal portion of the body (*i.e.* from the cloacal orifice to the extremity of the foot) is constantly of less length, often very markedly so, than the pre-intestinal region (*i.e.* from the mastax to the extreme front of the body); the foot is therefore necessarily very short, and its spurs are of notably minute size. All are oviparous species. Dr. Hudson does not (or did not up to 1889) recognize this genus, and refuses to separate it from the older Callidina, under which latter generic name several of Milne's species of Macrotrachela are included in the "Supplement."† It is true that no better generic distinction between the two has yet been diagnosed than the seemingly arbitrary one of relative lengths above given, but it is no less true that all the species of Macrotrachela agree closely with each other in regard to general appearance and structure, and in habits, and appear to constitute a very satisfactory and distinct genus by themselves. The mere non-presence of eyes is no longer a sufficient character on which to base a rotiferous genus, as was done with Callidina. One of the Macrotrachelas (*M. Roeperi*) has itself a pair of distinct frontal red ocular spots, and the neighbouring genus, Adineta, originally instituted from the knowledge of a single species with the generic character "eyes absent," now presents the anomaly of a second species, since discovered, possessing very conspicuous visual organs.

While it is thus apparent that the present genera of BDELLOIDA will need revision in the future, when further discriminating characters may have been detected, the general, and I think the increasing, feeling among rotifer-workers is that the genus Macrotrachela is a good one, and for these reasons I adopt it here.

The present species occurred to me amongst some Jungermannia gathered from damp ground in a swampy, wooded hollow at Wanstead Park, Essex, in October last. It is, for its genus, a large bulky species, and is rendered very distinct from any of its fellows by the curious long chitinous spines or bristles with which its integument is furnished, and which, when the creature is retracted, (Fig. 26), give it a very unapproachable aspect. These bristles are not scattered haphazard over the surface of the body, but are arranged in definite order at particular spots. A half-whorl of eight spines occurs upon the ventral surface of the thicker basal portion of the neck; of these eight (Fig. 30), the outer or most marginal pair are very long and directed downwards, the next pair are shorter, and the central four mere tiny points; together they form a spinous half-collar round the neck, and possibly aid in locomotion by catching on to the surface over which the animal is crawling. No trace of spines is seen upon the dorsal surface of the neck.

Upon the trunk the spines are all confined to the dorsal and lateral surfaces, the venter being quite free from these appendages—unlike the neck, where, as just stated, the reverse is the case. Numerous bristles, those nearest the front of great length, occur towards the lateral aspects of the trunk, arranged along two longitudinal submarginal ridges on each side; a third, more ventral, and less distinct ridge, runs parallel with these, on each side, and bears several very minute blunt projections. Across the middle of the back runs transversely an elevated ridge, which bears four short conical blunt spines at the points where the longitudinal ridges of the trunk meet the cross-ridge—in addition to those longer lateral spines where it joins the lateral longitudinal ridges. The transverse ridge, and its spines, are best observed in a retracted individual (Fig. 26), when the points are seen to project stiffly upwards as a defence to the back; when the creature is fully extended, as when crawling, the ridge itself is almost, though not fully, obliterated, and its spines likewise become less distinct. A couple of small spines, close together, occur upon the median line of the back, in front of the ridge. Further back, the trunk presents an always conspicuous transverse fold of the integument at a point where, in retraction, a sudden diminution in its width sets in. This fold bears dorsally some five minute, pointed projections, sometimes placed at unequal intervals, as well as a pair of larger spines on each side terminating the lateral longitudinal ridges.

Yet more to the rear, upon the narrower portion of the trunk, occur, also dorsally, two cross-rows of short, sharp, conical spines, five spines to each row, the outer or most lateral one on each side being slightly larger than the median three, in each case,

* "Proc. Phil. Soc. Glasgow," 1885-6.

† "The Rotifera: Supplement, 1889." Longmans.

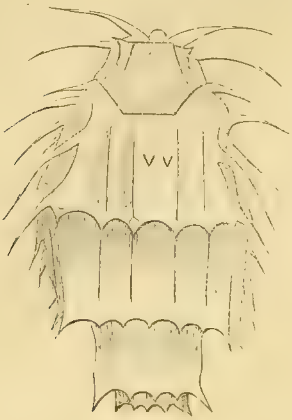

Fig. 26.—*Macrotrachela multispinosa*, n. sp., retracted, dorsal view.

Fig. 27.—Ditto, retracted, ventral view.

Fig. 28.—Ditto, optical section through neck, showing spinous half-collar.

Fig. 29.—Ditto, foot-spurs, dorsal and lateral views.

Fig. 33.—*Macrotrachela papillosa*, foot-spurs, dorsal view.

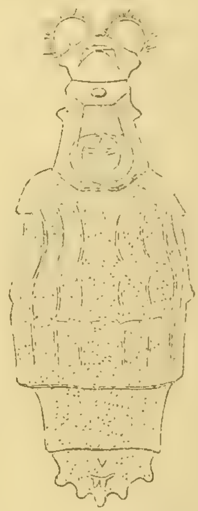

Fig. 30.—*Macrotrachela papillosa*, n. sp., dorsal view, corona expanded.

Fig. 31.—Ditto, dorsal view, retracted.

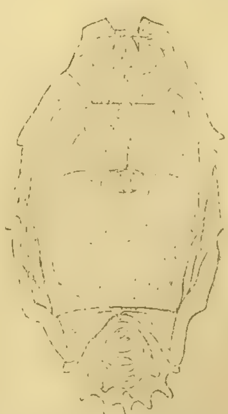

Fig. 32.—Ditto, ventral view, retracted.

All (except Figs. 29 and 33) are drawn to uniform scale, viz. × 300 diam.

Between the two rows are a pair of sharp spines occurring close together, side by side, upon the mid-dorsal line. The anus opens just behind the more posterior of the two rows, whose spines are always conspicuous from apparently terminating the body as the animal lies back upon its retracted foot. All the dorsal spines upon the trunk project upwards in a formidable manner as the creature crawls, but incline backwards when the animal is retracted.

Upon the foot itself at least two rows of small spinous points exist, crossing the dorsal surface transversely, as well as probably a few scattered spines ; but as this appendage is usually quite hidden within the trunk, except when the animal is crawling, the exact number and position of the foot-spines is not easily arrived at, nor is this at all important.

The longest bristles upon the body equal in length the dorsal antenna ; they are swollen at their bases so as to remind one of a nettle-hair seated upon its basal bulb. I have met with specimens in which the spinous appendages were not provided with the long terminal setæ usual in other individuals, but this is evidently a mere unimportant variation, the result of accident, for I have seen, on another specimen, a spine evidently (from its unsymmetrical condition to its fellow) broken off above the swollen basal portion, and another bent sharply at right angles at the same point.

The only Macrotrachela hitherto known as possessing spinous processes is *M. aculeata* (Milne), but in it these are all wide scale-like processes resembling those of *Philodina aculeata*, and very different from the long bristles of the present species; curiously enough, Mr. Bryce has found a third spine-bearing form, distinct from either of the preceding, which he has described at a recent meeting of the Quekett Club, under the name of *M. spinosa*.

The general shape of the body when the coronal lobes are expanded, bears a resemblance to that of *M. quadricornifera*, but with, of course, the addition of the spines; the coronal wheels also resemble that species, except that they are narrower. In *M. multispinosa*, the moderately wide corona expands scarcely wider than the neck, and consists of two distinct lobes, separated by a noticeably deep square sinus, in width equal to half that of each "wheel."

The neck is but little more than one-third the greatest width of the trunk, and the fully-expanded coronal wheels less than one-half the latter.

The frontal column is thick, cylindrical, moderately long (about same length as the dorsal antenna), and terminated by strongly developed cilia beneath a minute hood.

The dorsal antenna is rather more than three-quarters neck-width in length, stout, two-jointed, and with three terminal tufts of parallel-projecting setæ : it can be slightly nodded, in a similar manner to what is seen, very much more evidently, in *Rotifer macroceros*.

Eye-spots are entirely wanting. The mastax exhibits two prominent thick teeth crossing each ramus, and numerous fine striæ.

The food within the stomach is not moulded into pellets, as is constantly done in some allied species ; a host of small spherical globules do occur within the body, and are liable to be mistaken for food-pellets, especially as they are frequently seen moving about *en masse*. These globules represent, I think, the highly sacculated, thick, glandular wall of the stomach, beneath which the minutely granular food may be seen turning over and over locally within the central lumen, by the action of the lining cilia. The intestine wall is thin and non-glandular.

A large opaque brown ovum within one individual bore witness to the oviparous mode of reproduction. The foot-spurs, seen dorsally, appear as very small, blunt cones, as figured, with an interspace between : in side view, they are seen to be very slightly decurved. The toes, apparently three in number, are thick, fleshy, and truncate, with distinct ducts running through them.

All the specimens of this form that I have seen have been extremely sluggish creatures, lying in the retracted condition, with both the fore-parts and the foot withdrawn within the trunk, in the manner customary with Bdelloids, often for many hours at a time. For this reason, it is considerably difficult to hit upon an individual nicely expanded and feeding, with rotating wheels, so as to secure a sketch of the animal in that state ; especially as specimens are few and far between. The body is much flattened from dorsum to venter and broad in its central part, both in retraction and when expanded. The animal varies in colour from a scarcely perceptible yellow tinge, almost colourless, to a decided brownish yellow, in different specimens, probably according to age.

When fully outstretched, the trunk is seen to pass backwards *gradually* into the foot, which is very short.

The individuals of this species have a characteristic mode, when feeding, of sitting up upon their retracted foot, supported by the five small spines upon the rear of the trunk, and with their bodies held upwards in the water at an angle, and wheels rotating.

The length of the animal, as retracted, varies from $\frac{1}{200}$ inch to $\frac{1}{135}$ inch in different specimens ; when sitting back upon the foot, rotating, about $\frac{1}{100}$ inch.

Sp. Chars:—Body broad and flattened, yellowish or brownish, furnished with numerous long bristles and shorter spines arranged along definite lines, the longest bristles with slightly bulbous bases. Corona moderately wide, scarcely wider than the neck, of two distinct lobes, with a deep square dorsal gap between. Dorsal antenna rather more than three-quarters neck-width, with three terminal tufts of parallel setæ. Rami with two prominent teeth. Food in stomach not in pellets. Foot-spurs minute, blunt cones.

Macrotrachela papillosa.

As long ago as July 1889, amongst the beautiful feather moss, *Thuidium tamariscinum*, growing in a thicket at Hindover, in Sussex, I met with a Callidina which presented the peculiarity of being covered, about its foot, with conspicuous blunt papillæ. But a solitary individual was seen, and a rough sketch and a few notes were all that could be secured of the unfamiliar form. I never came across a second specimen until in September last, when examples of what is evidently the same creature occurred to me from similar moss taken from old tree-stumps in Epping Forest, near Chingford; and I have since seen numerous other specimens from near Epping, again amongst *Thuidium*, and also from Wanstead Park. These more recent examples I now proceed to describe.

The most obvious characteristic of this form, next to the possession of the tubercles already referred to, is that the greater portion of the integument is very beautifully marked with fine raised dots, giving a shagreened appearance to the skin. This dotting is most evident upon the dorsal surface, but occurs also upon the ventral face both of the trunk and the neck-base, only those portions of the foreparts and foot being destitute of the shagreening which are not exposed during complete retraction of the creature. Even the tubercles themselves are covered with dots.

The general disposition of the papillæ follows that of the spinous processes of the last described species. Indeed, so similar in this respect, as well as in the broad, flattened outline of the body, and the proportions of the corona, are the two species, that I have hesitated between regarding them as distinct forms, or as merely extreme varieties of one species. But, in addition to the fact that I have not found the two intermingled in one gathering, the *constant* differences in the form of the foot-spurs, and the number of teeth upon the rami, and the presence of the peculiar skin-marking in the present form (which is never seen in *multispinosa*), make it clear that we have to deal with distinctly separate species.

The integument is, in *M. papillosa*, evidently of considerable firmness of texture, since it resists decomposition long after the removal of the soft internal tissues. I have seen empty skins, with their tubercles and dotting complete; the stiffened integument thus approaching in character the fully chitinized lorica of *Dinocharis*.

Upon the neck, at the level of the dorsal antenna, and close behind the position of the infolded coronal lobes, occurs a blunt angular projection upon each side, with a half-circlet of small rounded papillæ ventrally. The succeeding, basal neck-segment bears two conspicuous, down-curved, blunt or acute, conical lateral protuberances, having very wide bases. These processes upon the neck project from and serve to guard the anterior opening of the body in complete retraction of the animal. The thick basal neck-joint, though itself fully of as stout consistence as the trunk and similarly shagreened, has its anterior border of membranous texture, and this frilled edge covers in and protects the more frontal parts during retraction.

The bold lateral skin-corrugations of the trunk bear several usually prominent blunt projections corresponding to the bristle-like appendages of *M. multispinosa*. The dorsal longitudinal folds of the integument are indistinct in retraction, but usually very conspicuous when the creature crawls. The rearmost segment of the trunk, just above the cloacal orifice, bears a dorsal row of five conspicuous tubercles arranged transversely; these vary in different individuals from mere hemispherical knobs to quite elongated digitiform processes, but are always prominent objects, since they form the apparent termination of the body as the creature lies with foot retracted within the trunk. In some specimens, if not in all, an extra papilla, smaller and less noticeable, occurs upon each side of the obvious five. Immediately in front of this cross row, the same hindmost trunk-segment bears a pair of tubercles, closely approximated side by side upon the median dorsal line, and further forward, a single median pimple; all these are plainly shagreened, like the general surface of the body. No ventral papillæ exist upon either trunk or foot.

The very short foot, of four joints, carries two cross-rows of small tubercles dorsally, six papillæ to each row, those of the hinder row very irregular and truncated projections. The third foot-joint bears the usual spurs, which are very small, blunt, obliquely apiculated processes, with no interspace; in shape they somewhat resemble those of *M. quadricornifera*. The foot ends in three very short, thick, truncate, fleshy toes.

The expanded corona is identical with that of *multispinosa*, of two distinct lobes, with a deep median sulcus equal in width to half each wheel; the whole being a little wider than the neck, and just half the greatest width of the trunk.

The frontal column is fairly long and stout, terminated by the usual decurved membranous hood, appearing hook-like in side aspect, beneath which are strong active cilia, forming the anterior disk for attachment of the animal when crawling.

The dorsal antenna is long, equalling in length the column, and very nearly or quite equal to the neck-width; it is two-jointed, constricted below its summit, and bears thereon three diverging tufts of but slightly radiating long setæ.

The mastax is rond-ovate, and each ramus is crossed by three prominent teeth, with a fainter fourth. The salivary gland apparently unilobed, and very granular in one specimen.

Food in stomach not moulded into pellets. Paired gonads and moderate contractile vesicle normal. Lateral canals not detected.

The trunk and basal neck-joint have a brownish hue, while the retractile foot and fore-parts are quite colourless.

Several individuals were noticed surrounded by, and dragging about, small masses of adherent floccose, but the majority are quite clean. One specimen remained healthy and active for days, while infested with some schizomycetous fungus growing from its integument. Length, when retracted, $\frac{1}{200}$ inch to $\frac{1}{175}$ inch.

Sp. Chars. Body broad and flattened, brownish, with prominent tubercles upon the trunk and foot. Neck with angular lateral projections. Integument shagreened. Corona moderately wide, a little wider than neck, of two well-separated lobes. Dorsal antenna equal to neck-width. Rami with 3 prominent teeth, and a fainter fourth. Food not in pellets. Foot-spurs small, apiculate, without interspace, resembling those of *quadricornifera.*

MONSTERS.

By F. Edward Hulme, F.L.S., F.S.A.

THE love of the marvellous is deeply engrained in human nature. We may see abundant proof of this in such classic myths as the Sirens, in the monstrous forms carved or depicted in the temples of Egypt or Mexico, in the popularity of such books

Fig. 34.

as the Arabian Nights' Tales, or the adventures of Gulliver, down to the fearful joy of the youngsters in the nursery in the sanguinary giant whose food was the blood of Englishmen.

> "Far away in the twilight time
> Of every people, in every clime,
> Dragons and griffins and monsters dire,
> Born of water or air or fire,
> Crawl and wriggle and foam with rage
> Through dark tradition and ballad age."

The fell harpies, the monstrous roc, the death-dealing basilisk, the phœnix, the chimæra, the monstrous kraken, the deadly cockatrice, the fire-drake, Dagon (half-man, half-fish), the vulture-headed Nisroch, the treacherous Lorelei, sweet Queen Mab of fairyland, fiery dragons, ghastly wehr-wolves, mer-

Fig. 35.

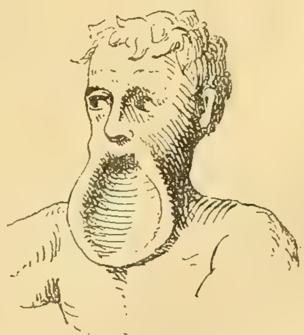

Fig. 36.

maids, centaurs, together with the great sea-serpent, the toad embedded for countless centuries in the rock, and other wonders that still turn up from time to time during the dull season in the newspapers, are but a few examples that at once occur to one's thoughts. Ovid and Pliny in their day went to very

considerable lengths to satisfy this love of the marvellous; in the middle ages writers not a few discoursed of dog-headed men, of pigmies, of "the anthropophagi, and men whose heads do grow beneath their shoulders," while no country fair in this present year of grace would be considered by its patrons at all up to date unless it included a giant and a dwarf, together with a two-headed calf or some such monstrosity.

To deal at all comprehensively in the limits of an article with a subject so far-reaching is a manifest impossibility. We propose, therefore, to touch upon but a few mediæval examples, being more especially

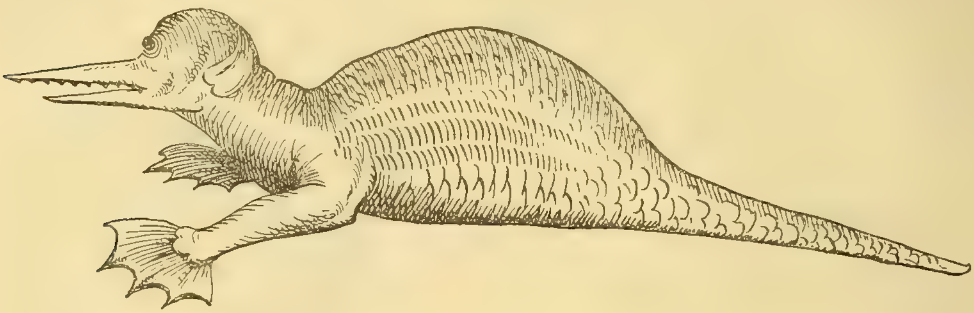

Fig. 37.

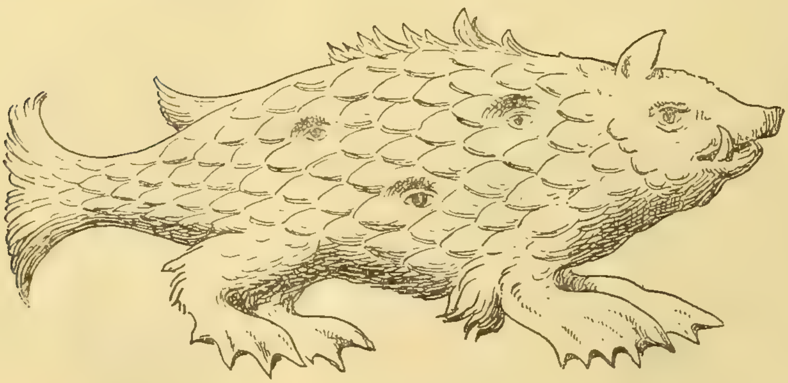

Fig. 38.

inspired to do so by a book open before us, the "Historia Monstrorum" of Aldrovandus. With one exception (Fig. 37), we have derived our illustrations from this work. The book in question is of folio size and full of engravings of the quaintest description; it was published at Bologna in 1642 and is one of a series of books on natural (or in this special case unnatural) history, written by this old author and published sometimes at Bologna, sometimes at Venice, sometimes at Frankfort. As all alike were written in Latin and appealed to the cultured of all Europe, the actual place of their production was a matter of but little moment.

In looking into the whole matter one is at once struck by the impossibility of producing anything really original in the way of monsters. The Chinese, perhaps, have come as near to it as any people, in their strange grotesques, but all the various modifications, no matter how weird and bizarre they may be, have no absolute originality; they are merely the combination, addition, suppression, or exaggeration of various natural forms, or possibly owe their wonder to a mere alteration of scale. Thus the chimæra slain by Bellerophon had the head and body of a lion and a tail like a serpent, while from its back rose the head of a goat; while another well-known combination is the human head and body and the piscine extremities that go to build up a mermaid. As examples of addition, the unicorn is but a horse plus a horn; while the cyclops, with his one eye, or the headless men, are instances of monstrosity springing from suppression. The Fanesii, a tribe said to live in the far north, were credited with ears so long and pendulous that they could wrap themselves up in them, a charming arrangement of Nature to supply the overall or great coat that the climatic conditions rendered so necessary; while the author of "Guerino Meschino" writes of Indians with feet so large that they raised them over their heads to avoid sunstroke, another interesting illustration of the adaptability of Nature to the needs of

her children. Each of these latter examples clearly falls into our section of monsters developed by the exaggeration of forms in themselves natural. The mere alteration in scale gives us dwarfs, pigmies, fairies and giants, or such an imagining as the kraken, or the creature mentioned in the Arabian Nights, a fish so immense that mariners take it for an island, and land thereon, only finding out the error of their view as the increasing heat of the fire they have kindled produces the sudden submergence of what they had deemed terra-firma.

The wondrous creatures of Aldrovandus are divisible into three classes :—creatures that are absolute impossibilities, such as (Fig. 35), "homo ore et collo gruis," a man having the head and neck of a crane ; secondly, various species of malformation and abnormal growth, which do undoubtedly occur from time to time ; and thirdly, other forms suggested by this second class, but altogether carried to impossible excess.

It is of course easy, having realised that a lizard with a forked tail is somewhat of a curiosity, to make a much greater wonder by representing a ten-tailed lizard ; and while a boy born without arms is a painful possibility, the wonder is undoubtedly greatly increased by also cutting off his legs and replacing them with the tail of a fish.

The creature he calls hippopos, having the head, arms, and body of a man, but terminating below in the legs and hoofs of a horse, was, though here only two-legged, probably suggested by the centaur myth. Amongst the other impossibilities, which, it must be borne in mind, the old writer brings forward in the most perfect good faith, is a man of normal growth, except that he has elephantine ears that reach to his knees, a man with the head of a wolf, the lady (Fig. 34), who is distinctly of harpy type, a ram-headed individual, and a boy with the head of an elephant.

This notion of the substitution of heads has a great charm for Aldrovandus. He gives us elsewhere a bird-headed dog, and horses, goats, pigs and lions, all with human heads ; while the "Monstrum triceps capite vulpis, draconis et aquilæ" is, we venture to think, a creature that neither Aldrovandus, nor anyone else, ever did see or ever will see. According to the picture it had a human body and legs, differing, however, from those of ordinary humanity in being clothed with large scales. One arm was like that of a man, the other was the wing of an eagle, and a horse's tail in rear was another distinctly abnormal growth, while surmounting all were three heads, those of a wolf, a dragon, and an eagle. There are many other such atrocities ; while they are curious as showing the depth of credulity our forefathers could reach, it will readily be seen that they are the dullest things possible. Anyone with a slight knowledge of zoology could create them by the score, placing, for instance, on the neck of a giraffe the head of an elephant, giving it the body of an alligator, and finishing off all neatly with the tail of a peacock.

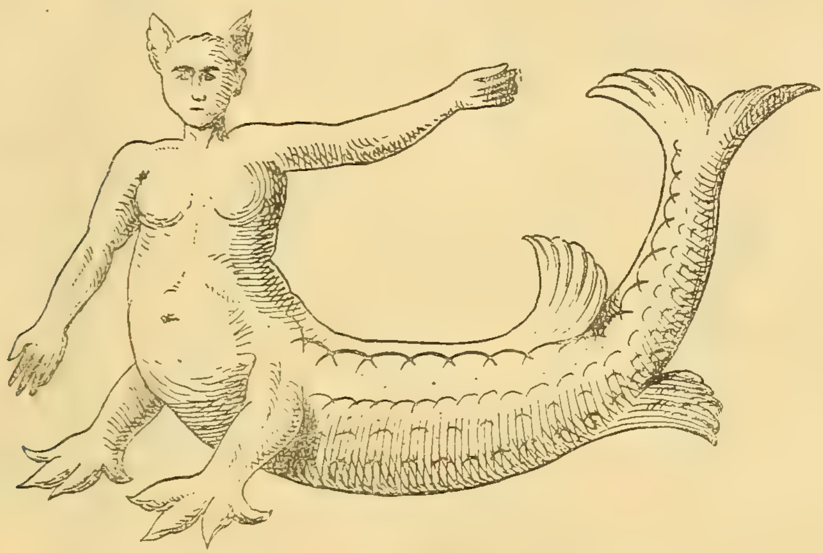

Fig. 39.

The multiplication or suppression, or distortion of various parts is a very strong point with Aldrovandus. He illustrates for our benefit four-legged ducks and pigeons, and two-headed pigs, sheep, cows, and fishes ; calves, dogs, hares, each walking erect on their hind-legs and having no front ones, and pigs, cats, dogs, chickens, double-bodied but single-headed. He also tells us of headless men, and gives us a draw-

ing of one, neckless, having the ears rising from the shoulders, mouthless, the nose a proboscis, a foot or so long; this and the eyes are on the back of the figure. Fig. 36 we may fairly include as an example of distortion, while Fig. 40 is a monstrosity produced by suppression. In another place he gives a drawing of a man having two eyes in their natural position, and beyond each of these another.

One quaint picture shows us two men wearing large ruffs and habited in quite the costume of "the upper ten" of the seventeenth century, but their faces are covered with thick hair, their eyes peeping out like those of a Skye terrier. This idea was too grotesque not to utilise to the utmost, so the next picture is that of a young lady in the same plight.

It was a favourite mediæval theory that all creatures of the land had their marine counterparts. "There is nothing," says the comparatively modern writer Camden, "bred in any part of Nature, but the same is in the sea"; while Claus Magnus affirms that "there be fishes like to dogs, cows, calves,

Fig. 40.

horses, eagles, dragons, and what not." These mysterious denizens of the deep were an unfailing resource in the romances and poems of the middle ages, and an article of faith with the writers on natural history. On the Assyrian slabs we see the "monster, upward man, and downward fish," while the mermaid we all recognise as a most familiar instance of this belief in the presence of creatures at least semi-human in the broad and mysterious expanse of ocean. Bœwolf, the Saxon poet, writes of "the sea-wolf of the abyss, the mighty sea-woman." The quotation is not altogether complimentary in its sentiment: no lady of one's acquaintance would feel flattered on being addressed as a sea-wolf. But while a certain halo of romance has in these later days gathered round the idea of the mermaiden, those who really believed in her gave her credit for deeds considerably more heinous than combing her flowing hair in the sunlight, since her beauty was a snare and destruction to those who came within its fatal influence.

This belief in sea-monsters of all kinds was naturally not a chance that a man like Aldrovandus would miss. He gives his imagination full scope, or perhaps we should rather say his credulity, as he introduces these creatures to us as things as real as a rabbit; his sea-monk, for instance, with tonsured human head, arms replaced by fins, and legs by fishy tail, being as matter-of-fact as one's vicar. Fig. 41 is given in all good faith as the true presentment of a sea-bishop, though not at all our notion of a bishop in his see. The right hand, it will be seen, is giving

Fig. 41.

the benediction. The dragon of the deep (Fig. 37) aims at being terrible, but merely succeeds in being feeble. We cannot but feel that the draughtsman here failed to reach our ideal. One has certainly seen many representations of land-dragons far more fear-inspiring than this bloated monster with ears like a king Charles spaniel, and tail like a rat. This illustration is from another source, the work of Ambrosinus on the same subject, published "permissu superiorum" in the year 1642. While the book is as quaint and grotesque as any of its rivals,

the skill of the engraver has in divers cases not paralleled the gifts of description of the author.

The monstrosus sus marinus, or terrible sow of the sea, or more especially perhaps of Aldrovandus (Fig. 38), will surely come up fully to everyone's expectation of what a marine pig should be like. Catching a weasel asleep should be a comparatively easy task to circumventing sus marinus: it seems such a peculiarly wide-awake animal. Possibly in the struggle for existence in the watery depths its toothsome flesh may place it in jeopardy, and Nature may have bestowed on it these numerous eyes to enable it to evade dragons and other foes having a penchant for pork; a rather unexpected addition to the various better-known examples of that comfortable doctrine for the well-to-do, the survival of the fittest.

Another of the strange creatures of ocean is shown in Fig. 39. It is somewhat startling to reflect that our ancestors had at least the expectation that such a monster might at any moment rise alongside their vessel and address them in the imperious tones that the figure suggests; and it must be borne in mind that these illustrations are not a tithe of the strange imaginings that even this one old book sets forth, though it is needless to further multiply examples. We have carefully drawn our figures in facsimile from the originals, and have nought extenuated, nor set down aught in malice. They are fairly typical examples of the sort of thing that is encountered on page after page.

Apart from these various monsters and the hundreds of others that keep them company, Aldrovandus seems to have been always accessible to anyone who could bring him one wonder the more; hence he also figures a bunch of grapes terminating in a long beard; representations of cloud-warriors in conflict in the sky; comets like flaming swords, and many other wonderful things that set our ancestors wondering in fear and amazement as to what such portents should signify.

While we may wonder at the credulity of those who wrote and read such books, the love for the marvellous—witness spiritualism—has by no means died out amongst us. Barnum's stuffed mermaid was a wonder not by any means to be missed by thousands of people who were born centuries after Aldrovandus, while a book on natural history in our possession, that was published in London in 1786, gravely describes the unicorn, the several kinds of dragons, the lamia, the manticora, and other fabulous creatures in the same matter-of-fact way that it deals with the horse or the cow.

The whole world has now been so ransacked that there is little room in these times for the imagination to play; but in mediæval days travellers brought back such wonderful stories—some of them true, and others, perhaps, a little wanting in that respect—of the things that they had seen, that almost anything then seemed a possibility.

SOME FAMOUS COLLECTING-GROUNDS FOR DRAGON-FLIES.

By the Author of "An Illustrated Handbook of British Dragon-flies," "A Label List of British Dragon-flies," etc., etc.

II. EPPING FOREST AND THE METROPOLITAN DISTRICT.

SITUATED in the South-East of England and adjacent to the Continent, this district, as may be expected, constitutes one of the richest for insect life in this country. More species of Dragon-flies have probably been recorded within its area than in any other in the British Isles.

That delightful domain Epping Forest certainly ranks second to none in England, for the richness of its dragon-fly fauna, combined with sylvan scenery which is of the most delightful description imaginable. Every enthusiastic London entomologist ought certainly to be thankful that he has at his doors such a treasure-house of insect life as this vast forest constitutes itself to be.

The following are the names of some of the dragon-flies which have been recorded as having occurred in Epping Forest:—*Leptetrum quadrimaculata* and variety *prænubila* (plentiful), *Sympetrum vulgatum* (very abundant), *Gomphus vulgatissimus*, *Anax formosus*, *Brachytron pratense*, *Æschna mixta*, *Æ. cyanea*, *Calopteryx virgo*, *C. splendens*, *Lestes nympha*, *L. sponsa* and *Agrion mercuriale*, (the latter very local species has been taken here, I believe, by Mr. W. H. Nunney. It is only known to occur in one other locality in the British Isles, namely in the New Forest).

The following is a complete list of the species of dragon-flies which have been known to occur in the metropolitan district, with the localities where they are found (excluding Epping Forest):—*Platetrum depressun* (very common), *Leptetrum quadrimaculata* (common, the variety *prænubila* occurs at Godalming, in Surrey), *Libellula fulva* (marshes in the vicinity of Bermondsey), *Orthetrum cærulescens* (found not uncommonly in the metropolitan district, particularly in the vicinity of Godalming, and used to occur plentifully in some marshy ground at Hampstead, where, however, it is probably now extinct), *O. cancellatum* (Croydon canal and neighbourhood abundant, marshes in the vicinity of Crayford and Dartford, also Peckham and Honour Oak Wood), *Leucorrhinia pectoralis* (this species is included in the British list on the strength of one specimen only, which was captured on a boat at Sheerness in January 1860, and subsequently exhibited at a meeting of the Entomological Society of London. It had most probably been conveyed, over here from the opposite shores of Belgium, and I may remark that it was described by Dr. H. A. Hagen in 1857, in the "Entomologist's Annual" of that date, as a species which was likely to occur in this country,

although it had not previously been turned up on this side of the English Channel. The specimen under consideration was most probably a hibernated example), *Sympetrum vulgatum* (very common, I have seen this in great abundance at Herne Bay and elsewhere), *S. meridionale* (only two specimens of this insect have ever been taken in this country, both in the metropolitan district; they were formerly included in the celebrated collections of Messrs. Evans and Wailes), *S. Fooscolombii* (this species has only been captured in this country on three occasions, one of which happened in the metropolitan district, a second one occurring at Deal), *S. flaveolum* (this has been taken in several places in the vicinity of London. In the year 1871 several examples were seen in the Strand by Mr. McLachlan; in the year mentioned it was exceedingly common in the metropolitan district), *S. sanguineum* (Birch Wood, Colney Hatch, Coombe Wood, Deptford and Dover), *Cordulia ænea* (occurs at Godalming in Surrey, and Woodford in Essex; several specimens have also been taken in the neighbourhood of Hampstead), *Gomphus vulgatissimus* (has been taken at Highgate, Coombe Wood, Dartford and Dinmore Hill), *G. flavipes* (this magnificent insect has never been known to occur in the metropolitan district proper; the only specimen which has occurred in the British Isles was captured by Mr. Stephens near Hastings, on the 5th of August 1818), *Cordulegaster annulatus* (this large species is rare in the neighbourhood of London), *Anax formosus* (has occurred near Hertford, also at Southgate, Wandsworth and Wimbledon Commons) *Brachytron pratense* (not uncommon but local, Hertford, Hastings, etc.), *Æschna mixta* (this very rare insect has been taken at Godalming and Norwood in Surrey), *Æ. cyanea* (common everywhere), *Æ. grandis* (not uncommon but local), *Æ. rufescens* (the occurrence of this grand insect in the metropolitan district is exceedingly doubtful), *Calopteryx virgo* and *C. splendens* (abundant everywhere), *Lestes nympha* (Wanstead in Essex, etc.,), *L. sponsa* (Plaistow in Essex, etc.,), *Platycnemis pennipes* (local), *Enallagma cyathigerum* (common), *Agrion pulchellum* (very abundant), *A. puella* (very plentiful everywhere), *Ischnura elegans* (very common), *Pyrrhosoma minium* (very plentiful everywhere) and *P. tenellum* (local). It will be seen from the above that the dragon-flies of the metropolitan district present a very fine array of species, although a vast deal has yet to be ascertained respecting their distribution in this rich collecting-ground, as well as in the rest of this country.

THE GEOLOGY OF BARBADOS.

THE importance attached to the report of Messrs. Jukes-Browne and Professor Harrison on the above subject, induces me to send you the following notes bearing upon the same.

For some years prior to the lamented death of Mr. H. B. Brady, it was my good fortune to be in constant contact with that gentleman by both interviews and correspondence, and it was no unusual occurrence to receive consignments of material from time to time for the purpose of examination, thus assisting him in the mechanical part of the work, and at the same time considerably benefitting my collection of Foraminifera. It was in this way the material collected by the above-named gentleman came into my possession.

I do not think I shall be committing any breach of etiquette if I give an extract from a letter received with these deposits, as it throws a side-light on the matter which probably would not otherwise be known, it bears date August 16th, 1889, and is as follows:

"My friend Mr. Jukes-Browne, late of the Geological Survey, has been visiting Barbados and brought home a large collection of rock specimens, deposits, etc., of which it is of some importance to trace the history.

"He asked me to furnish him notes on the Foraminifera, and I, not quite knowing how far I was committing myself, pretty much promised to do so. Thereupon he sent me a dozen specimens, and I set to work washing them, etc. etc. They were disintegratable under treatment, but!—but this is all that can be said; for the most part they were the most refractory material I ever took in hand. I worked at them more or less, I think, every day for a fortnight—reducing ten of them to moderately satisfactory conditions. But some of these, though reduced in bulk from three or four ounces to less than a drachm, still would be the better for further washing. They are much more interesting, I suspect, for their siliceous organisms than for their calcareous remains, but with the former I have nothing to do; Mr. Hill, of the Geological Survey, I believe, has worked at these. It is quite possible some of these deposits contain no Foraminifera at all."

I received altogether nine packets of these deposits, and on referring to my notes I find three samples yielded fairly good results, three a very few specimens, and the remainder were without any trace of Foraminifera.

Since reading the report of the late meeting, as published in SCIENCE-GOSSIP for January, I have re-examined the type-slide I have of these mounts. They are grouped as a whole without reference to the particular beds from which they were taken, and the subjoined list includes all the species which can be clearly distinguished. The relative frequency of the species is indicated by the letters C., common; R., rare; V. R., very rare. I have also given the maximum and minimum depths at which similar species were taken during the *Challenger's* survey, as given in Mr. Brady's report. If we exclude the three

pelagic forms (Globigerinidæ) and take the mean average of these figures, the result shows that the entire group of forty-two species may be stated to give in round figures 890 fathoms. The fact this list teaches is, I think, that a very fair percentage of the species present are of undoubtedly deep-water habits, in our present seas, and that about twenty-four per cent. only fail to attain a maximum depth of 1000 fathoms.

On the other hand it is only fair to acknowledge that a considerable mixture of deep and shallow-water forms frequent some localities. Thus *Challenger* station 209 affords an example. Dredgings from Cebu, 120 fathoms, present a very strange assortment of species, but it is as a whole we must be guided in forming an opinion on what must, to a very large extent, be after all only conjectural.

BARBADOS FORAMINIFERA.

	Frequency.	Maximum and minimum Depths.
		Fathoms.
Nubecularia lucifuga	R.	18
Bigenerina pennatula	R.	350 to 675
Gaudryina pupoides	R.	50 to 1450
„ rugosa	V. R.	11 to 670
Bulimina inflata	V. R.	95 to 2435
Pleurostomella rapa	V. R.	129
„ alternans	C.	1375 to 2350
Bolivina punctata	V. R.	2 to 2750
Cassidulina crassa	C.	40 to 2760
„ subglobosa	C.	12 to 2950
Ehrenbergina serrata	C.	150 to 2350
Lagina striata	R.	2 to 600
„ formosa	V. R.	littoral to 1850
„ gracilis	V. R.	129 to 2775
„ trigona marginata	V. R.	90 to 2300
Nodosaria (Glandulina) lævigata	V. R.	50 to 1360
„ (?) abyssorum	C.	1825
„ filiformis	R.	50 to 450
„ hispida *var.* subineata	C.	95 to 435
„ mucronata	R.	620 to 2600
„ obliqua	R.	1500 to 2000
„ inflexa (fragments)	R.	95 to 1400
Frondicularia interrupta	V. R.	129
Cristellaria rotulata	V. R.	littoral to 2200
„ cultrata	R.	38 to 2435
„ gemmata	R.	95 to 210
Polymorphina rotundata	R.	50 to 1850
„ longicollis	V. R.	1100 to 2425
„ lactea	V. R.	shallow to 2350
Uvigerina angulosa	C.	50 to 1375
„ asperula *var.* auberiana	C.	580 to 610
Sagrina striata	R.	3 to 350
„ raphanus	C.	2 to 260
„ columellaris	C.	6 to 1125
„ virgula (monomorphous var.)	C.	12 to 2075
Globigirina bulloides	C.	pelagic
„ cretacea	R.	pelagic
„ bulloides *var.* triloba	C.	pelagic
Pullenia quinqueloba	C.	20 to 2750
Truncatulina wuellerstorfi	R.	350 to 2435
Pulvinulina auricula	V. R.	littoral to 500
„ crassa	C.	420 to 2740
„ repanda	R.	littoral to 1000
„ pauperata	R.	675 to 2350
Rotalia soldanii	C.	300 to 2000

There were also present fragments of a very thin outspread Calcarina, but not a single perfect form could be obtained from the material at my disposal.

W. H. HARRIS.

Ilfracombe.

SCIENCE-GOSSIP.

PROFESSOR DUNER, a Swedish astronomer, has just made known an important work which has led to important results concerning the rapidity of the sun's rotation. By observing the displacement of the lines of the solar spectrum, Professor Duner has obtained a hitherto unknown exactitude in the measurement of the movements of the sun, and found that that body moves on its axis at a rate of a mile and two hundred and forty-two feet in a second of time. The sun's day lasts therefore at its equator twenty-five days and twelve hours of our reckoning. Duner's measurements result in a different length of rotation in different parts of the body of the sun, regularly increasing in length from the equator to the poles, so that those parts of the sun's surface lying near the two poles have a day as long as forty-six of our days. This is only possible with a movable and gaseous surface like that of the sun.

M. LOCARD has completed a census of the shell-fish of France, and finds that there are 1,500 marine and 1,250 odd non-marine (that is to say, fresh-water and land) species of molluscs within the bounds of the mother country. This, of course, is vastly more than England can boast. But that is only to be expected, as our shores are chillier than hers, and our area much more limited. Thus the Mediterranean alone yields nearly 1,200 species—all our British molluscan fauna is about 550 marine and 150 non-marine forms.

PROFESSOR E. RAY LANKESTER, F.R.S., on Thursday, February 11th, began a course of three lectures on "Recent Biological Discoveries"; and the Right Hon. Lord Rayleigh, F.R.S., on Saturday, February 13th, a course of six lectures on "Matter: at rest and in motion."

THE Editor has to appeal to the patience and good feeling of his correspondents if he has not answered all of them up to date, as he has been a severe sufferer from what is now known as the "prevailing epidemic."

AT a recent meeting of the Field Naturalists' Club of Victoria (Australia) the distinguished botanist, Baron Von Mueller, advocated the protection of insectivorous and native birds, by putting a comparatively heavy tax on guns. He thought naturalists should form a union for the purpose of suppressing bird-slaughter, and that each member should wear a badge.

ZOOLOGY.

NATURAL HISTORY POSTAGES.—Though naturalists make much use of the post in the matter of exchanging specimens, I find that both local postal authorities and naturalists themselves are often

ignorant of a valuable concession lately made to them by the General Post Office. In course of exchanging helices with a correspondent in France, I found that it cost me a shilling to return boxes that he had sent for a penny. Our local officials assured me this was all right, but I wrote to the General Post Office, and have received the following letter, which will be useful to those who, like myself, want to get foreign helices by exchange. It runs thus:—

General Post Office,
8th February, 1892.

SIR,—In reply to your letter of the 27th ultimo, I beg to state that the packets in question containing conchological specimens are, in strictness, only transmissible to the colonies and foreign countries at the letter or parcel rate of postage; but in compliance with the earnest desire expressed in a memorial recently addressed to the Postmaster General by a number of persons engaged in scientific pursuits, instructions have been given for such specimens to be allowed to pass at the sample rate, viz., 1*d.* for a packet weighing under 4 oz. The Department cannot, however, guarantee the due delivery abroad of packets so prepaid, inasmuch as they do not come within the definition of sample packets as prescribed by the Postal Union. I am, sir, your obedient servant,

J. E. SIFTON.

Re Rev. J. W. Horsley.

I presume I am right in deducing from the above that a box of specimens weighing, say, six ounces would cost a comparatively large amount, but if the contents were divided into two boxes or parcels weighing three ounces each, they could be sent to any country in the Postal Union for two pennies. I do not think the last paragraph of the letter need frighten us; for if, as I find, France has no objection to send us a box for 10 centimes, I do not suppose she would refuse to receive it back for a penny.—*J. W. Horsley.*

NEO-DARWINISM, ETC.—Although I think that discussions on the highly-contentious and quibble-evoking problems of evolution are rather to be deprecated in the present state of science, yet it is hard to resist offering a few remarks on the various matters so clearly put forward in the series of contributions entitled "Neo-Darwinism" published in last year's volume. Let me distinctly observe that I am not an evolutionist, so that all that concerns me here is to endeavour to discover which theory of evolution is a scientific one and which is not. With this proviso, and commencing with Lamarck's views, it may be broadly asserted that of the three means of transmutation viewed subjectively, so to speak, the first is not so unscientific, nor the second quite so preposterous as is stated; while again, after a very fair translation of his second law, an objection is raised that it offers no explanation of the phenomena of adaptation, the first law, which does do so in the only possible scientific way, is not even mentioned. Further on, after recalling that Lamarck's laws are "a mere *à priori* speculation not supported by a single fact of observation or experiment"—a statement which, to say the least of it, is not a bit too mild—the luminous principle, theory, *vera causa*, process, factor, etc., of natural selection is held to rest secure on the threefold "factors" of variation, of heredity, and of the struggle for existence. Of these three the first two are not, properly speaking, factors at all, while the last, viz., the struggle for existence, is the primary factor in the Darwinian hypothesis, and, as originally conceived, a more utterly baseless, imaginary, and loosely indefinite conjecture anent the phenomena of life was never foisted on the world in the name of science. It would be absurd to deny that Sir C. Lyell was very nearly right when he declared Darwin's doctrines viewed fundamentally to be a "modification of Lamarck's doctrine of development and progression." The "modification" simply consisted in adopting mechanical forces in lieu of physiological ones, and in introducing the element of fighting and contention where Lamarck merely indicated the needs and habits of the organism, the latter being again more subjective, as it were, and getting nearer the life of the process. It seems pretty certain that if the late C. Darwin had been a true scientist, the phantom of analogy between artificial selection and natural selection would never have been raised. Moreover, the not very astounding prevalence of Darwinism in this country can be most adequately explained by considering that it was found to accord well and fitly with the character, not the ideas, of those individuals who rushed so eagerly to embrace it. Finally, as to whether the Lamarckian or Darwinian views is more in accordance with the highest, best, most scientific and sympathetic idea of animate life, I leave to the judgment of the intelligent reader. The question of heredity is a very difficult one, and the science of embryology, which bears upon it, is only in its infancy. The various views and theories anent this subject are, so far as my knowledge goes, very fairly and clearly explained, and described in the papers under review. The very useful table annexed will show that out of the six theories four and a half are in favour of, and only one and a half are against the doctrine of the transmission of acquired characters, a proportion that does not much magnify the importance of the statement that "no one doubted, until quite recently, that characters acquired during the life of the individual were hereditary." The point of paramount interest here for an outstander is not so much as to which theory of heredity is right or wrong, but as to which theory if carried out would effect the transmutation of species, etc., most readily and thoroughly. Certain learned professors have held that upon Weismann's

principle we can explain inheritance, but not evolution, an extremely important consideration which is not even hinted at in these papers. It seems to me, however, that if our theory of evolution so far as it goes rests on a scientific basis, our theory of heredity also so far as it goes can be safely left to take care of itself. For instance, if it can be shown that through use or disuse a muscle has or can be transformed into a ligament or vice-versa, we may rest assured that the offspring of that organism will share the same change, *i.e.* the mechanical or organic causes which induced the modification in the parents will be bound under similar conditions of life, etc., to work to the same effect in the immature offspring, so that practically it will come to the same thing in the end whether this acquired character was hereditarily transmitted or not. This is apparently all that the Neo-Lamarckians claim when they hold that acquired characters tend to reappear in some degree in the offspring; and as all logical evolutionists are bound to believe in pantheism, spontaneous generation, and Haeckel's law, who knows but that in the course of time such changes actually take place in the uterus itself, without the primary action of external conditions of existence, etc., being any longer necessary? Finally, it may be insisted that if acquired characters are not inheritable, there is no possible logical standpoint between the doctrine of special creation, *i.e.* of many different independent types, and the doctrine that each germ-unit of the lowest organisms contains within itself all the potentialities that are actually developed in the highest vertebrates.—*Dr. P. Q. Keegan.*

BOTANY.

ORNITHOPUS ROSEUS.—On July 15th last year I found the above plant growing on the bank of the Severn, close to Dowles Church, about one mile above Bewdley. It is well established there, growing in quite a wild state in great profusion. This is a continental species. I am not aware of its having been cultivated in this country; it has, I believe, been tried in France, but without much success. I am at a loss to find a reason for its occurrence there, unless the seeds have been brought over among foreign grain, and somehow got deposited there.—*Jno. E. Nowers.*

GEOLOGY.

MORE ABOUT HASTINGS.—It is generally considered probable that the greater portion of the invading Norman army landed at Bulverhythe—I am referring to Mr. Holmes' interesting article, "Notes on the Site of Old Hastings." The sluggish stream which winds through the marsh-land, commonly termed "The Salts," still bears the name of the Haven. The site of Bulverhythe, as it existed at the date of the invasion, is now submerged, about three miles from the present high-water mark. Bulverhythe is now only represented by a few modern cottages, the dilapidated walls of an ancient chapel or oratory, and a roadside inn denominated the "Bull," which there is some reason to believe stands on the site of an old hospitium. It is, however, of a discovery made a few years ago in the immediate vicinity of the ruins of Hastings Castle that I would now make particular mention. It may interest some of the readers of SCIENCE-GOSSIP to know that a little door, close to the entrance-gate of the castle, on the left side as it is approached, leads to some torture-chambers in a wonderful state of preservation, apparently of Roman origin. An order is required to view them, a wise precaution to prevent the defacing of the walls, which are hewn in the solid sandstone rock. On passing the door there is a small chamber a few feet square. This had previously been used by the caretaker of the ruins as a coal-cellar. One day, when moving some rubbish, he came upon a steep flight of steps leading to a narrow arched passage—but I will endeavour to describe the place as I saw it. Having obtained a candle, for the darkness of the vault is intense, I passed down the steps, which are curiously grooved in the centre, to the passage. This passage is not cut in a direct line but winds in certain places, and consequently the arches of the roof—about eleven feet high—are formed on the skew. Proceeding a few yards, I came to a recess in the wall raised by a step about seven inches high. In the wall were holes where staples had evidently been fixed to fasten the necks and extended arms of the victims, who were crucified there and left to die, in the darkness, of starvation. There were several of these recesses, and all bore the same marks in the wall. One was evidently arranged so that merely the toes of the victim could touch the ground, and I could not only see where they had worn smooth the sandstone steps, but on the candle being held to throw a light sideways against the wall the distinct impression of the human form, where no doubt victim after victim had worn and darkened the sandstone in the agony of his dying struggles. On proceeding further, the passage turned abruptly to the left and widened into a chamber about twelve feet square. This, from marks in the wall, had evidently been partitioned off from the passage. In it was a small hollow in the wall, near the ground, about eighteen inches square. It was blackened by the action of fire, and as there was no flue connected with it, it was probably used for asphyxiating those who had been enclosed in the chamber. I may add that the rough groove in the steps at the entrance of the dungeon, may probably have been made by the heavy fetters or chains of the victims who were dragged down into the dreadful darkness never to return alive into the light of day.—*W. E. W.*

PAPERS ON FLINT.—Mr. G. Abbot will not find anywhere a complete bibliography of papers on "Flint": he will have to seek them out by searching in all likely periodicals and serials, amongst which let him not forget the "Proceedings of the Geologist's Association." Several papers on the subject appear therein, but two will be specially helpful—Professor T. Rupert Jones "On Quartz, Flint, etc.," in vol. iv., p. 439 *et seq.*, and Professor Judd "On the Unmaking of Flints," in vol. x., p. 217 *et seq.* In both these papers abundant reference to the writings of others is made. Articles published between 1874 and 1884 will, of course be found in the "Geological Record." The list annually published by the Geological Society in their "Quarterly Journal" should also be gone through.—*B. B. Woodward, British Museum, (Natural History.)*

NOTES AND QUERIES.

SOME FAMOUS COLLECTING-GROUNDS FOR DRAGON-FLIES.—Errata: page 18, first column, for *Lepletum quadrimaculata* read *Leptetrum quadrimaculata;* for *Anaso formosus* read *Anax formosus;* for *Enallagma cyastrigerium* read *Enallagma cyathigerum;* for river Soar read river Stour. Second column: for *Ischnura pumilis* read *Ischnura pumilio.*

A SNAKE-STONE.—Can any reader of SCIENCE-GOSSIP inform me of the monetary value of a scorpion or snake-stone one inch long, half an inch wide, and about as thick as a bean, which it very much resembles; brought from India; there used to absorb the poison from snake-bites.—*Enquirer.*

A DOG AS STATION-MASTER—The death is announced of a popular member of the staff of the Great Eastern Railway, namely, the black-and-tan collie dog long familiar to passengers at the Lowestoft station. This well-known animal appears to have originally appointed himself to fulfil the duty of starting the trains, but time and habit seem to have fully ratified the appointment. By a marvellous instinct the collie, it is said, seemed to know the exact time at which a train should begin its journey. and a restless excitement characterised him as the appointed moment drew near. As the bell uttered its first sound, he would scamper down the platform, and, planting himself close to the engine, bark furiously until the wheels began to move. Satisfied apparently in this respect, he would next make a move for the guard's van, and hurry the guard to his post. As the train passed out of the station he retired, and no more was seen of him till a similar operation had to be repeated on the departure of another train. No other bell than that used for starting purposes would bring the animal to view.

DEATH OF THE AMERICAN ALOE.—A Parsonstown correspondent writes:—The close of the year has seen the death of the celebrated specimen of the American aloe, that completed its century of existence in the conservatory of Birr Castle last August. On that occasion the beautiful plant threw out great clusters of yellow flowers about the size of the large double chrysanthemums that took the prize at the recent Dublin show. On blooming—an event that only occurs when the specimen reaches one hundred years of age—the plant gave a loud report like the sound of a rifle-shot, and an hour later the flowers so rare were found on its stem. The pecularity of this rarity was its abnormal height: it rose to an altitude of 23 feet, a point never reached out of tropical climes. The Earl of Rosse and his astronomer (Dr. Boeddicker), both distinguished botanists, watched the progress of the plant with great diligence and made frequent observations of its development that will be an invaluable record to botanists. There are numerous specimens of the aloe in Ireland, but mostly of dwarfed or stunted growth and no authentic information has been obtained as to their exact age. In the case of this one, its history has been traced back to the time it was planted in the Castle, and in its three leading characteristics—blooming only once in its life, living to its hundredth year and then dying—all the traditions of its species have been verified, and can now be accepted as ascertained facts. Concurrent with its death was the growth of a group of seedlings at its base, and these have been carefully transplanted to perpetuate the memory of the interesting centenarian plant from which they sprang.

INTELLIGENCE OF THE CAT.—There are many wonderful stories told of the doings of the cat, chiefly regarding their progeny and other unusual associates. The late Dr. Maxwell of Glasgow, when taking a walk one morning in Glasgow Green, near Nelson's Monument, saw a cat going towards the river Clyde. When it came to the river it went up some distance, then took to the water; but before reaching the opposite side the current had carried it a considerable way down, and it landed at the only place near where a landing could be made. The Doctor fully believed that the cat had calculated on the distance that the stream would carry it down, so that it could gain the proper landing.—*D. R.*

A SWAN'S FEAT.—Mr. T. Midgley, the well-known curator of the Bolton Museum, writes to the "Manchester City News" as follows:—Among the many interesting accounts which one finds recorded in your Natural History Notes, perhaps a feat of one of the swans belonging to the Bolton Corporation will bear recording. On Monday morning, as I passed along the side of the snow-covered greensward which skirts the large lake, I noticed a group of three swans standing about ten yards from the water. One of them deliberately laid its body on the surface of the snow, used its legs, after the fashion of boys when tobogganing, to give its body a start, and away it slid down the bank, gaining speed as it went; and, the water's edge being a little below the ground, performed a half-somersault on to its back into the water. Whether all three were enjoying themselves in this playful manner or not my duties did not permit me to stay to watch, but it struck me as one more instance of the peculiar habits of these birds.

APPROACHING EXTINCTION OF THE LAPWING.—Plovers' eggs are sought for more diligently every season, the finders being well paid for them by dealers, who sell them at a good profit. The bird is becoming scarce in consequence, and farmers complain that insect-life is becoming intolerable It is believed that nothing but stringent legislation will prevent the wholesale destruction of the eggs and the eventual annihilation of the bird. The eggs are very difficult to procure, the nests being scattered up and down a wide extent of ground, the site being selected where the colour of surrounding objects approaches as closely as possible to that of the eggs. When human intruders approach the nest, which is of the

simplest construction, the parent birds dash and whirl about in the air with noisy, plaintive cries, often descending and reeling along the ground in front of the egg-seeker, as though both wings were broken. Dogs often become expert in finding the eggs. Those of the sparrowhawk, the moorhen, the coot, and the black-headed gull are often sold as plovers' eggs.

BARBARIC SLAUGHTER OF LARKS.—The "Vegetarian" says:—During the late heavy fall of snow in Sussex, many hundreds of men employed themselves in catching larks. The way in which they catch them is the following: On the ground is spread a net something like a tennis-net, only not so heavy. It is fixed at the ends by stakes in the ground, and a rope, fastened at one end, is held by the operator. As the larks in cold weather fly very low (about two feet from the ground), they pass across the net and immediately as they do so the cord is pulled, and the net falls over and catches them. In this manner hundreds and thousands of larks are killed every day. As soon as the lark is under the meshes of the net, the man (or more generally, the boy with him), runs forward and crushes the lark's head between his thumb and forefinger. Between Newhaven and Brighton, it is estimated that on Friday and Saturday there were between 200 and 250 men entrapping these birds, each, on an average, catching as many as five dozen, making in all about 1,250 dozen, or about 15,000 beautiful songsters thus slaughtered to be sent up to the London Markets.

THE SOLAR YEAR.—I see that in my note under this heading I carelessly wrote of the precession of the equinoxes as if it were caused by the sun's actual progress through space—which, of course, would give quite a fabulous idea of the rate at which our system travels. I should rather have said "an apparent progress," really due to certain checks on the earth's motion, described in every astronomical manual.—*C. B. Moffat.*

A BEES' NEST IN A BLOCK OF STONE.—Two men in the employ of Mr. Shepherd, builder, of Cardiff, recently made an extraordinary discovery in the Royal Hotel building-yard. They were engaged sawing a huge block of stone, from the quarries near Bath, when the saw cut through a bees' nest almost in the centre of the stone. Some of the bees were crushed to death, but the living ones came swarming out, frightening the stone-cutters, who beat a retreat. The stone is about 6ft. square, and how the bees got there and lived in such quarters seems rather a mystery. There is, however, a hole about 6 in. across running through the stone. This hole seems to have been once occupied by the root of a tree.

"EUROPEAN BUTTERFLIES."—There are a few printer's errors in my notes on "European Butterflies" in your February number, but the only one that need be noticed is that which occurs at p. 29. The third paragraph begins "Here" but this word should be Hera, the scientific name of the Jersey tiger-moth, an insect not noticed in Newman but undoubtedly British, it having been first taken some years ago in Devonshire (by Mr. Jäger), where it has since been found annually.—*R. B. P.*

CUCKOO IN CONFINEMENT.—While having holidays last summer (1891) I made the acquaintance of a gentleman who possessed a small collection of live birds, caught in the neighbourhood. Among the rest he had a cuckoo, taken from the nest in the season 1890. In winter it lived in the kitchen, and in summer hung outside, being taken into an outhouse during the night. They feed the bird on raw beef, sometimes roasted, eggs, potatoes, etc. The bird can be very savage at times, especially when strangers go near the cage. Since last Christmas one of the sons has kept it in a saddle-room. During the whole of its confinement it has not been known to utter a single cuckoo.—*W. R. Riley, Halifax.*

A PROVIDENT FIELD-MOUSE.—It is, I suppose, well-known to most field-students that rats and mice cart out their rubbish at the back-door of their burrow. At the entrance to a field-mouse's hole this winter there is accumulated a great quantity of the husks of beech-mast, evidently cast out recently by the mouse. But it is a curious circumstance that no beech-mast was produced in my neighbourhood this year. Therefore the stores which have apparently lasted this animal till January 1892 must have been collected in the autumn of 1890. Some rats which I have lately been watching carry ivy-leaves into their holes at one side of a wall, and soon afterwards toss them out at the other.—*C. B. Moffat.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

TO ANONYMOUS QUERISTS.—We must adhere to our rule of not noticing queries which do not bear the writers' names.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply DISGUISED ADVERTISEMENTS, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges," which cannot be tolerated.

WE request that all exchanges may be signed with name (or initials) and full address at the end.

SPECIAL NOTE.—There is a tendency on the part of some exchangers to send more than one per month. We only allow this in the case of writers of papers.

TO OUR RECENT EXCHANGERS.—We are willing to be helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

R. B. POSTANS.—Will you kindly send us your address, so that proofs of your articles may be sent you?

EXCHANGES.

WILL send collections of two hundred named specimens (sixty species) Victoria shells, in return for same number named recent shells of any other country.—F. L. Billinghurst, National Bank of Australasia, Castlemaine, Victoria, Australia.

APRILINA, rufina, protea, ferruginea, oxyacanthæ, cerago, silago, pyrimadea, meticulosa, gothica, spadicea. What offers? Northern insects wanted.—A. E. Gibbs, "Herts Advertiser" Office, St. Albans.

WANTED, some secondhand entomological store-boxes, 5s. size preferred.—A. E. Gibbs, "Herts Advertiser" Office, St. Albans.

MELICERTA, floscularia, and other living rotifers; infusoria, rhizopoda, entomostraca, algæ, and insectivorous plants, offered in exchange for micro. slides, books, pamphlets, or magazines containing articles on pond life.—C. Lord, 34 Burlington Crescent, Goole.

OFFERED, *Helix pygmæa*, *Pupa ringens*, *Planorbis nautilus* var. *crista*, and many other local species. Wanted, *Clausilia Rolphii*, *C. biplicata*, *Helix revelata*, *H. lamellata*, *Zonites Draparnaldi*, *Pisidium nitidum*, and varieties of land shells.—A. Hartley, 14 Croft Street, Idle, near Bradford, Yorkshire.

WANTED, Cole's "Methods of Microscopical Research," Marsh on "Section Cutting," and good interesting micro. slides, in exchange for slides of brittle star (*Ophiocoma neg-*

lecta), palate of limpet, &c.—H. McCleery, 82 Clifton Park Avenue, Belfast.

WANTED, mounted or unmounted parasites, parts of insects, &c., unmounted preferred. Will give slides or unmounted objects in exchange.—George T. Reed, 87 Lordship Road, Stoke Newington, London, N.

WANTED, Braithwaite's "British Moss Flora," Parts 9 and 12. Exchange mosses and books.—J. A. Wheldon, 9 Chelsea Road, Walton Vale, Liverpool.

DUPLICATES, L. C., 8th ed.: 73, 189, 356, 620, 923, 1172*b*, 1315, 1397*c*, 1441, 1669, 1838. Desiderata, 74, 106, 117, 160, 354, 374, 551, 560, 619, 716, 731, 745, 760, 824, 932, 980, 1136, 1403, 1431, 1574, 1591, 1593, 1603, 1625, and many others.—E. D. Bostock, Stone, Staffordshire.

"Field Club," 1890, "Nat. Gazette," 1891, SCIENCE-GOSSIP, 1889, 1891, unbound, clean; exchange or offers.—W. Turnbull, 1 Horne Terrace, Edinburgh.

WANTED, rook and rabbit rifle, rare birds' eggs and micro. slides. Will give in exchange treadle fretwork machine, almost new, by Trump Bros., two model yachts, cutter about 3 feet 4 inches, and yawl about 4 feet long, with sails, masts, and spars complete, clinker built and sail well, duplicate birds' eggs (blown, two holes), book of crests about 200, including a few of the peerage, military and naval, thirty-five different war-ships, and eleven different offices, hospitals, &c., Oxford and Cambridge colleges; also several unbound vols. of "Boys' Own Paper."—A. J. B., Frogmore Cottage, Tregony, Grampound Road, Cornwall.

WANTED, a treadle fret-saw, in exchange for good specimens of British land and freshwater shells, correctly named and localised, or for young plants of some of the best varieties of the cactus tribe.—M. A. O., 82 Abbey Street, Faversham, Kent.

EXCHANGES desired in British mosses—about eighty duplicates. Lists exchanged.—Miss E. Armitage, Dadnor, Ross.

"Natural History of Insects" (Murray, London, 1830), in two vols., published at 5*s*. each, second edition, numerous woodcuts. Will exchange for a few good foreign shells.—W. J. Jones, jun., 27 Mayton Street, Holloway, London.

WHAT offers in fossils or minerals for yellow copper, grey copper ore, biotite, atocamite, etannine, cassiterite, wolfram, calcite, gabbro, steatite, &c.; Hamblin Smith's "Algebra," Angel's "Animal Physiology," Ahn's "German Method," Wrightson's "Agriculture," and Burton's "Anatomy of Melancholy"?—W. H. Olver, 2 Adelaide Terrace, Truro.

WANTED, micro. slides; will exchange good microscope.—Palmer, Tettenhall, Wolverhampton.

WHAT offers for SCIENCE-GOSSIP vols. for 1885–91, complete, 1880, 1881, 1884, incomplete; all coloured plates complete; also "The Naturalist," vols. for 1889–91, complete, and the "British Naturalist for 1891, complete.—Lionel E. Adams, Penistone, Yorks.

WANTED, British coleoptera and lepidoptera, or books on entomology, in exchange for periodicals.—Thos. W. Wilshaw, 455 Shoreham Street, Sheffield.

WANTED, any of the following varieties of *Helix aspersa—nigrescens, conoidea, globosa, grisea, Helix arbustorum* var. *albinos, Pisidium nitidum, Helix nemoralis* vars. *albescens* and *studeria*. Offered, *Planorbis glaber, Helix sericea, H. rupestris, Pupa secale, Zonites glaber*.—Rev. W. Eyre, Swarraton Rectory, Alresford, Hants.

ARCTIC tern eggs, perfect, for which I should be glad to exchange lesser and common terns' eggs, jackdaws', sparrow-hawks' (number for value), &c.—T. R. Clephan, Middleton St. George, near Darlington.

OFFERED, SCIENCE-GOSSIP for 1890 and 1891, also last two vols. of "Science and Art" (iv. and v.), unbound, in perfect condition. Wanted, birds' eggs, one hole.—Geo. Nicholson, 3 Crown Street, Newcastle-on-Tyne.

JARDINE'S "British Birds," Waterton's "Essays on Natural History," Galton's "South Africa," Rennie's "Insect Miscellanies." Exchange lepidoptera, or offers.—F. Emsley, 98 West Street, Leeds.

OFFERED, South African coleoptera and lepidoptera (unset) in exchange for other coleoptera and lepidoptera (unset, and foreign to Europe).—O. West, Poplar Villa, Lansdowne Place, Port Elizabeth, South Africa.

WANTED, cabinet to hold 200 or 300 micro. slides. State requirements to—R. de H. St. Stephens, 25 Fordwych Road, West Hampstead, London, N.W.

WANTED, shells not in collection. Offered, other shells. Foreign correspondence invited, especially in India or China.—E. R. Sykes, 13 Doughty Street, London, W.C.

WHAT offers for "British Fungi," by M. C. Cooke, 2 vols., newly bound, half-calf, nicely tooled; set of plates of Cooke's "Freshwater Algæ," and "British Lichens," by W. C. Lindsey, half-calf.—X., 28 Hampton Road, Bristol.

WANTED, Johnston's "Non-Parasitical Worms," and Dalzell's "Powers of Creation." Exchange store-boxes and British insects.—R. Clark, 21 Grove Street, Retford, Notts.

OFFERED, Micro. slides, animal hairs, stomach and gizzard of beetles, &c. Wanted, slides, materials, or offers.—John Moore, 223 Great Russell Street, Birmingham.

SMALL lathe for lens and object grinding, several lens tools, laps, slitting discs, emery wheels, &c.; also "Carpenter on Microscope," 1881, air-pump, and materials for mounting. Binocular or other exchange wanted.—Dr. Taylor, patent expert, 57 Chancery Lane, London.

CEYLON butterflies. Will exchange a collection of 150 for good microscope or camera.—E. J. Woodward, Selwyn Road, Eastbourne.

Helix Bourcieri, Orthalicus Bensoni, Bulimulus arbustus B. Mastersi, Succinea Australis, Hyria corrugatus, &c., offered in exchange for land-shells from Java or New Guinea, or offers.—Miss Linter, Arragon Close, Twickenham.

BACK numbers of SCIENCE-GOSSIP for exchange: 271–276, 282–287, 292–301, also "Naturalists' Gazette," complete, for 1889 and 1890, all in good condition; also quantity of minerals. Wanted, Taylor's book on "British Fossils," or secondhand cabinet for minerals, or what offers?—William Hetherington, Nenthead, by Carlisle.

WANTED, trilobites or fossil fishes in exchange for carboniferous fossils or igneous rocks of this district.—John Millie, Echobank, Inverkeithing, Fifeshire, N.B.

WANTED, foreign stamps in exchange for fossils.—Fred. Cartwright, 20 Eldon Street, C.-on-M., Manchester.

BRITISH land and freshwater shells to exchange for exotic species not in collection. Foreign correspondence invited.—R. Wigglesworth, 13 Arthur Street, Clayton-le-Moors, Accrington, Lanc.

WANTED, numbers of SCIENCE-GOSSIP previously to 1874, parts of "Thesaurus Conchyliorum," and Tate's "British Molluscs," with coloured plates. Exchange in fossils, shells, &c.—Rev. John Hawell, Ingleby Greenhow Vicarage, Middlesbrough.

HOOKER'S "Student's Flora," "Naturalist" for 1878, &c., in exchange for Gremli's "Flora of Switzerland."—Rev. W. W. Flemyng, Clonegam Rectory, Portlaw, co. Waterford.

Unio margaritifer in exchange for lepidoptera, or offers.—Rev. W. W. Flemyng, Clonegam Rectory, Portlaw, co. Waterford.

HAVE a few dozen minerals which I want to give to school museum. Would any geologist kindly name them for me?—Jas. Ellison, Steeton, Keighley.

WANTED, good books on marine algæ and zoophytes, and other seaside studies, in exchange for Dolland telescope, micro. slides, or other books.—J. T. Neeve, 68 High Street, Deal.

WANTED, British and foreign star-fishes, sea eggs and crabs, sea-horse, and a good specimen of arragonite mineral, in return for fossils, British and foreign shells, microscopic objects and material, polished geological specimens of corals and spongy-forms, or state wants.—T. E. Sclater, Northumberland House, Teignmouth.

WANTED, *Lutraria oblonga, Terebratula caput-serpentis, Crania anomala, Pholadidea papyracea, Sphænia Binghami, Diplodonta rotundata, Cardium papillosum, pinna, Lima hians, Pecten Danicus, Pecten niveus, Trochus millegranus, Trochus granulatus, Stylifer Turtoni, Eulima stenostoma, Natica helicoides, Lamellaria perspicua, Aplysia depilans, Ovula patula, Akera bullata, Bulla hydatis, Acme lineata*, in exchange for other rare British shells, &c.—A. J. R. Sclater, M.C.S., Natural History Stores, 43 Northumberland Place, Teignmouth, South Devon.

BOOKS, ETC., RECEIVED FOR NOTICE.

"United States Geological Survey," Tenth Annual Report, 1888–89, part i., Geology (Washington: Government Printing Office).—"The Optics of Photography, and Photographic Lenses," by J. Trail Taylor (London: Whittaker & Co.).—"Dumaresq's Daughter," by Grant Allen (London: Chatto & Windus).—"The Idler" (Chatto & Windus).—"The Entomologist's Review," No. 1, vol. iii. (London: Elliot Stock & Co.).—"The Essex Naturalist" (Chelmsford: Durrant & Co.).—"W. P. Collins's Monthly Catalogue of Books" (London: W. P. Collins).—"The Journal of the Queckett Microscopical Club" (London: Williams & Norgate).—"The Essex Review" (Chelmsford: E. Durrant & Co..)—"Health at Home Tracts," by Alfred Schofield, M.D., M.R.C.S. (The Religious Tract Society).—"The Victorian Naturalist" (London: Dulau & Son).—"Contributions towards a Flora of the Outer Hebrides," by Arthur Bennett, F.L.S.—"The Collector's Monthly," &c., &c.

COMMUNICATIONS RECEIVED UP TO THE 12TH ULT. FROM: H. E. G.—O. M. M.—H. M.—A. S. O. S.—H. B.—K. H. J.—J. B.—R. B. P.—H. J. R.—M. D.—C. B.—G. E. H.—G. T. R.—B. W. W.—T. R. C.—H.—S. W. W.—G. N.—A. B.—W. L. W. E.—L. E. A.—J. J. C.—W. J. J.—A. W. St. C.—A. B.—M. A. A.—J. A. W.—W. T.—Dr. P. Q. K.—A. C.—S. M.—J. H.—A. B.—E. D. B.—E. G.—A. E. G.—W. E. W.—C. L.—R. B. P.—W. E. S.—A. C. S.—R. H. J.—R. J.—P. G. R.—A. J. C.—S. M.—F. C.—R. W.—J. M.—W. H.—F. E.—C. B. M.—J. H.—O. W.—J. T. N.—A. J. R. S.—T. E. S.—R. C.—R. D. H. S.—R. C. R.—M. D. D.—C. R.—E. R. S.—W. J. (good).—Dr. T.—J. W. H.—F. C. K.—J. M.—J. C. N.—J. E. L.—W. R. R.—Miss L.—J. E.—W. W. F.—&c., &c.

A FEW REMARKS ON OUR COMMONEST SPIDERS.

By K. HURLSTONE JONES.

I BELIEVE that there is no group of animals, which has been so much neglected by collectors and field-naturalists, as that of the spiders. The reason, I believe, is not so much their repulsiveness or commonness and apparent lack of interest, though for my own part I consider them far from repulsive or uninteresting, but the difficulty there is in preserving and storing them when collected. It is my intention here only to set down such things as have come under my own personal notice, therefore I shall be obliged to omit any attempt at a description of the very complicated structure of the spider, external or internal.

I am certain that very few of my readers are not aware, that the spider is not an insect. However, for the benefit of those who may never have given the point consideration, it may be remarked that a spider is at once distinguished from an insect by the facts that it has eight legs, and that its head and thorax are fused together. There are about five hundred and twenty-five species of spiders at present known in the British Isles, from which it is my intention to pick out some of the commonest, for the purpose of describing their mode of life and habits.

The first on the list is *Agalena labyrinthica.* This spider is exceedingly common on heaths and commons in the southern counties, out of which I have not yet observed it. The animal is of a greyish brown colour, approaching to a chestnut hue in the forepart of the body, while the hinder portion or abdomen is crossed transversely by dark bands. It spins a web which in the greater part of its area is flat, and very closely woven, being suspended from point to point of the heather or ling. But above this, crossing and recrossing in endless confusion are numerous single strands of the spider's silk, not unlike the rigging of a ship, while from one corner of the flat portion of the web, an exceedingly closely woven funnel of silk runs into the heather and down to the ground, in which the spider sits to await its prey, and down which it takes flight when attacked. At first sight it looks as if this funnel were merely a more closely woven portion of the web generally, but my humble opinion is that it is more than this. I observed that on dropping a grasshopper or other fair-sized insect into the web, in any part, no matter how far from the hole, the spider immediately dashed out, and, guided obviously by the vibrations of the threads, caused by the struggles of his captive, made at once, not to the insect, but close to it; here he stopped a moment, and feeling with his two front legs, came at once to his prey. I think this pretty effectually proves two facts, first, that these seemingly untidy, aimless webs, are arranged radially; just as carefully as those of the garden-spiders, which people think so beautiful, and that all the radiating threads, or at any rate the main ones of the web, are concentrated in the lower half of the network tunnel, to which all vibrations are, so to speak, telegraphed at once from the most distant part of the web, whither the spider immediately proceeds. The second thing I think proved by this is that a spider has but very limited powers of vision, otherwise it would rely less on its power of appreciating vibrations and more on its power of sight, in the capture of its prey. I made several experiments on the mode in which

this spider kills the prey which becomes entangled in its snare, and as I consider it curious, will describe it as well as I can. The spider on coming up to its victim, instead of going to, and fixing itself on it, and remaining there to suck its juices, as most of its species seem to do, makes a series of short dashes at its intended meal, pausing a few seconds between each, and at each rush inserts its poison-fangs. These dashes become slower and slower, or to speak more correctly, the pauses between them longer and longer, as the attack goes on, until the object of them at length lies motionless; when, if it be not too large, it is seized and dragged into the hole or tunnel mentioned above, and devoured at leisure. If, however, it is too large to be removed bodily, the spider detaches a limb at a time, and carries it away piecemeal. From this method of procedure I cannot help thinking that the poison causes moto-paralysis,—perhaps (it is to be hoped so) sensory as well, for I cannot say whether the animal which has been subjected to it is dead when removed. If two or three insects, or small spiders, are placed in the same web together, the owner dashes at them alternately, so as to make sure of losing none of them, and if any of them are small enough, they are carried off, struggling, down the tunnel, whilst their brothers in misfortune are dealt with.

I once put a specimen of *Dolomedes mirabilis*, the next spider I shall have to deal with, into a web of the species we are now considering, and was rather surprised to find that it was as much disabled and incapacitated by the net as any insect; it, however, defended itself bravely and after a couple of rushes, the tenant of the snare gave up its usual tactics and pursued another method of attack, which I had not seen the species use before, though it is common in some other genera. It ran round and round the unfortunate and unwilling intruder, carrying a thread of silk with it as it did so, until the poor wretch was simply swathed in a silken shroud, the maker of which was just going to produce the final scene of the tragedy, when I released the condemned martyr to science, and set him free. If two of the species are placed in the same net, they fight and chase one another, until one of them is either killed or takes refuge in flight.

Dolomedes mirabilis, the spider I have just mentioned as having been placed in the web of *Agalena labyrinthica*, does not appear quite so interesting as that species, perhaps because I have not observed it quite so closely; it is, however, far from lacking in interesting and peculiar habits, to a few of which I should like to call attention. This spider does not spin a snare. It is in fact a hunting-spider, obtaining its living by means of its powers of speed and leaping, which are very great, and its wonderful skill in stalking, in which no animal, I feel sure, can surpass it. Neither this, nor any other spider, however, is unprovided with silk and when the breeding-season comes round, which is in August and September, it spins a kind of thin net-work basket, connecting the tops of half-a-dozen grasses or blooms of heather, in which is placed a thick silken cocoon of a yellow colour, containing the eggs. But here comes the most interesting point about this creature: no one, I think, would imagine that anything approaching parental affection would be found in an animal so low down in the scale of creation as a spider, yet what I am going to relate looks uncommonly like it. The mother remains with the cocoon until the eggs are hatched, and if the nest is ruptured she immediately bolts off with it, (the cocoon), and sooner than part with it, allows herself to be caught and bottled, only loosing her hold when intoxicated by the spirit. Even when the young spiders are hatched, although generally not in the net, she is always close at hand, and the least disturbance of the nest brings her at once on the spot, which seems to prove that she must have communication with it by a thread. Having put in an appearance, she exposes herself so carelessly and with so little regard for personal safety that she can be captured with the greatest ease. The male on the other hand, so far as my personal observation goes, does not assist in these efforts for the safety of the family.

This reference to sex brings before us another interesting question; why is it that the males are so much scarcer than the females among this group of animals? I think the answer is two-fold. In the first place the spider is, I believe, a very amorous creature, and I am pretty sure that a youthful male at an age when he would be caressing an incipient moustache, were he homo sapiens, having put on his very best appearance, that is, having just cast his skin, goes off to start a courtship, probably with the first representative of the opposite sex and of his own species that he may meet. Now the lady spiders, not unlike some other animals a great deal higher up in the animal kingdom, object to the advances of "puppies," to use a figurative expression, but in place of treating the aspirant with cold contempt, they pounce upon him, and first murder and then eat him. In the second place, there is no doubt that most of the male spiders are considerably smaller and weaker than females of the same species, and this renders the above idea only the more probable. It will also be noticed by any observant person in the autumn months, how careful the male is in approaching the female, and at what a respectful distance he always keeps from her.

The spider which next comes before us is *Salticus cupreus*. *Salticus cupreus* is a true hunting-spider, the commonest British representative of the genus, and a pretty, clever, comical little rascal he is. He is nearly always found on walls in the hot sunshine, plying his vocation with untiring zeal and energy; he can run and jump like an acrobat, sideways as well as forwards, and his colours, which are black and

grey in stripes, are too conspicuous to permit his being easily forgotten when once seen. He stalks his prey, which consists of small flies, very small ones, for he is not much over a quarter of an inch in length himself. I have called him clever; and so he is, as far as the stalking goes. Yet I once saw one of these little creatures most awfully taken in, in the exercise of this power which they possess of stalking their prey. It was on a rather rough stone wall in Warwickshire, last year; the Saltici were hunting about in all directions for game, which was plentiful enough. On the wall some one had squashed a fly, so that the wings and the empty chitinous membranes which enclose and protect the legs and thorax, remained sticking to the wall by means of the dried contents of the body. Presently the wing, or some other portion of these melancholy remains, caught one or more of the eight eyes of our friend the Salticus, and he immediately made up his mind to dine off it. So he began with extreme caution to stalk the supposed fly, creeping, with his legs bent to their utmost extent, from point to point of the stone. Taking advantage of every little roughness and prominence, he at last arrived quite close and then sprang like a tiger (at least as I suppose a tiger would spring, and I am glad to say I have not seen it done), upon his prey. He took his disappointment very philosophically and went off in search of better luck at once. This I take to be another proof of the short-sightedness of spiders.

The last example of this highly interesting group of invertebrates is our large and common garden-spider (*Epeira diadema*), the white cross on whose yellow back is familiar to nearly every one. *Epeira diadema* is one of our largest spiders, and also one of the handsomest inhabiting this island; it belongs, moreover, to a large genus and one which has been remarkable for ages for the beauty and ingenuity of their webs. Diadema is found commonly enough on furze-covered commons and in gardens and lanes, in fact nearly everywhere, during the autumn months. This spider spins the well-known polygonal web, with its transverse spinal thread, which everyone knows, and which can be told from that of smaller members of the same genus from the size of the meshes. It has a curious habit of shaking its web violently; and so rapid are its oscillations in this act, that the spider cannot be seen at all; whether this is to clean the web from adhering particles or whether it is for concealment, I do not know. But I scarcely think the former, because the same movement which shook off the adhering particles would surely scatter the little glutinous globules, with which the threads are studded, and which hold the prey; neither do I think the latter is the probable cause, for on alarm being taken, the spider immediately drops to the ground by a thread. This spider has a habit with all its larger victims, of surrounding them with a shroud of silk, by spinning them round and round, before beginning to feed on them. In fact I have seen wasps so completely shrouded in this way that they were perfectly helpless. This spider either lies in wait head downwards in the centre of its web, or else lies concealed close at hand with its front pair of legs on one of the main supporting threads of the web, so that the least movement in it is communicated to its guardian.

I could write much more on this interesting and almost inexhaustible topic, but I am afraid of taking up too much space, and moreover of tiring your patience.

SOMERSETSHIRE SAND-TOTS :—THEIR GEOLOGICAL HISTORY.

THE geological history of blown sand is one of much interest. It plays an important part in the present phase of earth history, and opens up a variety of interesting avenues of fact and speculation in connection with the past history of the crust of our globe. Sand differs a good deal in quality and composition, being locally more or less abraded, and more or less mixed with organically derived and other matter, but in the main consists of quartz. It is coarse or fine generally according as it has travelled a short or long distance; for sand is a considerable traveller, and its origin has to be looked for often at great distances from where we find it. Wherever we find it, it has travelled; whether in the quiet bays of mountain brooks or on stretches of sea-shore, it has generally proceeded a greater or less distance from the rocks which produced it. How, then, is it produced? By water eroding the rocks in which it was originally more or less massive, and by the subsequent wear and tear of friction in water-channels. How it accumulates is at first sight not quite so obvious; but the process is nearly the same whether the accumulation be small or great. It is in the main a process of sifting; and the sifting is done by water-currents. Wherever rills trickle into streams, streams into rivers, and rivers into the ocean, the currents are constantly carrying off the finer and softer particles first, and redepositing these as muds or clays in quiet waters; leaving behind at first the larger fragments, whether soft or hard, until trituration has reduced the softer of these to fine particles. These again are removed and the harder parts are left behind in the form of sand, gravels and pebbles, to be again abraded and again carried down. This process has been ever going on, and we find sand in one form or other, in tremendous accumulations as rock, or sandstone in every known formation, and in some formations to the comparative exclusion of mud-rocks or shales. The estuary of the Severn illustrates the formation of sand in a very good way. The strong tidal currents sift the eroded and triturating material continually. New sand-banks form, the channels alter and immense quantities are carried down and deposited in the sea.

Quartz is one of the hardest minerals. Steel cannot scratch it. So that it follows as easy corollaries that quartz sand has resisted trituration longer than softer rock substances, and therefore as a rule has not travelled so far from its original site as softer and less dense rock material. Geologists, recognising this fact, are accustomed to say, whenever they meet sandstone in the earth's crust, that it indicates proximity to ancient shores; when they meet with grit and gravel-beds, that they are nearer still; with pebble beds (conglomerates), nearer still; and when the fragments are (generally) larger and angular, that they have the débris of sea-cliffs themselves (breccias).

Following the coast of the Channel until we reach the harder cliffs of more ancient rocks on the north and south, we have local deposits of sand derived in part from the cliffs themselves, especially from those older volcanic rocks which are largely composed of quartz; but we may pretty safely conclude that in most sedimentary rocks there is an admixture of quartz, although it may be so finely abraded as to escape naked eye observation.

In the formation of sand-tots, we have to consider a few fresh facts. We find them in the Severn Estuary in certain favourable places; where the tidal range is great, in deep bays, and with an exposure to the prevailing westerly or south-westerly winds. In Sand Bay the distance occupied by sand-tots is a mile and a half, from Woodspring to Kewstone. The soil inland is alluvium, lying upon liassic limestones and shales. In Weston Bay the distance occupied by sand-tots is a mile, from "the Beach" to Uphill. Here also, the soil inland is alluvium resting upon the lias. In the next bay, Bridgwater Bay, the distance is five miles from Brean Down to Bromham, and from Start Point to Stolford, four miles. Here also there is a fringe of sand-tots; and here also the land is alluvium, resting upon the lias. Beyond this point the shore rises into low liassic cliffs, and the sand-tots cease.

Fig. 42.—Sand-tots along the Somersetshire coast.

Inland of the tots at Weston the soil is very sandy and poor for a distance of some fields; but inland of this again, the soil improves as the underlying alluvium gets freer from sand.

The gradual growth of bent, seawards, furnishes the barrier against which the sand is blown, and it is to this grass that we are indebted for safety against inundation of the low-level alluvium that occupies large areas in the county between parallel mountain limestone ridges.

In the formation of the tots shorewards we have a double sifting process, a sifting of the waves in the formation of the sandy beach, and a sifting of the

winds in driving the lighter particles of sand shorewards.

In Weston Bay at low water the tide recedes for three miles, leaving an immense area of mud exposed. This is seen to be furrowed by the receding tides, channels of drainage in which much of the finer sediment is carried off. At times the mud appears to gain upon the sand, at others the sand upon the mud. In rough weather more sediment of all kinds is deposited, in fine weather the finer sediments are carried away, and in all weathers powerful tidal currents disturb the muds, and alter and sift the sediments.

The sandy beach is, I think, in the main formed by waves acting upon already deposited sediments. Every wave as it breaks pounds the beach, and the undertow carries away the finer and lighter material, leaving the coarser and heavier behind. The former is redeposited as muds of varying degrees of fineness, the fineness being greatest at the greatest distance from the shore, the latter is left to form the beach of sand, the finer particles of which are driven by the winds inward to form the tots. Dig below the sand and you will find clay, over mud, and therefore more remote from a former shore. Dig when you will in the alluvium, and if you dig deep enough for a few miles inland, you will find clay, a tolerably easy and convincing proof that the flat area between Cundon and Worle, and again between Worle and Banwell, was formed by the slow deposit of estuarine and marine sediments, that the land now cultivated was a muddy shore with probably an enormous tidal range, and that the process now seen to be going on in the formation of the tots has been going on for an incalculable period of time, and it may be assumed that they have not yet reached their maximum.

If a glance be taken at any ordinary map exhibiting the coast-line of Somersetshire (see sketch-map appended) between Clevedon and Stolford, the extent of alluvium (or soil deposited as the estuary has been gradually silted up) may be approximately measured by the extent of the moors and their number. Beginning at the north we have Nailsea Moor, and Kenn Moor, in which is the hamlet of Seymour (a common place and surname in Somersetshire, meaning most probably sea-moor); between the next two mountain limestone ridges, Locking and Weston moors; and between the Mendips and the Polden Hills, an extensive moor, bearing locally different names, as Glastonbury Moor, Godney Moor, Mark Moor, etc. Altogether the area of alluvium, or land gained from the sea, as silt has been deposited and the tidal waters have receded, may be stated at about fifty square miles. In many places in this district peat overlies the clay to a thickness of several feet; but what evidence of blown sand there may be in that area I am at present unable to state. Its comparative scarcity or absence inland must of course be attributed to the configuration of the land and the nature of its formation. As the bays gradually silted up, it is tolerably certain that the process began along the flanks of the bounding E. and W. limestone ridges; and as the sediment accumulated, the sides would expand and present a greater area to the prevailing winds, and thus favour the gradual accumulation of the ridges of sand which now form such a striking feature in the shore scenery of the Severn Estuary on the Somersetshire or eastern side. No doubt cultivation has obliterated some traces of inland sand; but as the tides recede and the bays get silted up, the sand-tots will grow seawards, as they have already done and are doing at the present time where the conditions are favourable.

T. STOCK.

CONTRIBUTIONS TOWARDS A LIST OF THE MOLLUSCA OF HEREFORDSHIRE.

HEREFORDSHIRE is but a little known county, and so it is little to be wondered at that there is no list of its mollusca, even moderately complete. Not that the following list is meant to be complete by any means, but I trust that it will serve as a basis for further records, and also interest some of your readers who pay attention to the distribution of British mollusca.

Messrs. Taylor and Roebuck's list (as given in Mr. Williams' smaller work) comprises only thirty-six species, most of them, curiously enough, being the rarer ones, *e.g.*, *Helix fusca*, *Clausilia laminata*, while one, *i.e.*, *Helix Cantiana*, I have not yet found at all: it also excludes many of our commonest and most widely distributed species, *e.g.*, *Succinea putris*, *Sphærium corneum*: so far, that is in the last two years, I have, with the invaluable aid of Mr. E. W. Bowell increased the list to eighty-seven species. The slugs I have not yet studied particularly, but I hope to do so in future, and many species are recorded in the list above referred to. Of course, I have not yet worked nearly the whole of the county, and no doubt many new species will be added by further search.

[Those marked (*) are recorded by Messrs. Taylor and Roebuck.]

Sphærium corneum. Very common.

Sph. rivicola. Not common and small. The Lugg at Mordiford, the Wye at Symond's Yat.

Sph. lacustre. Formerly very common in the Hereford and Gloucester Canal, which is now, unfortunately, drained, for the most part at any rate.

Pisidium fontinale. Abundant where it occurs: Tupsley: near Leominster.

* *Pisidium pusillum.* Common.

Pisidium roseum. Rare: but abundant near Stoke Edith.

Unio tumidus. Fairly common. The Wye specimens are small. Abundant, very fine and large in the Canal.

Unio pictorum. A few specimens in the Wye.

Unio margaritifer. Extremely abundant in the Wye, especially near Hereford.

Anodonta cygnæa. Common. The largest I have measures 6¾ × 3⅜ in. The immature specimens seem somewhat to resemble *A. anatina.*

Anodonta anatina. Local: the Wye at Symond's Yat, abundant: also, but very rarely at Hereford. I have one very curious specimen, which has two teeth, one on each valve, about the centre of the shell.

Dreissena polymorpha. Formerly very abundant in the canal at Hereford.

Neritina fluviatilis. Very local. Abundant in Wye at Symond's Yat.

Paludina contecta. "Hereford," De Boinville.

Paludina vivipara. Formerly abundant in the Canal.

Bythinia tentaculata. Very common.

Valvata piscinalis. Common: Canal: Staunton-on-Wye, etc. Frequently on Caddis-cases.

Valvata cristata. Rare: Tupsley. On Caddis-cases.

Planorbis nitidus. By no means abundant: Devereaux Park: Bartestre.

Planorbis nautileus. In a shallow pond at Bullingham, on oak leaves (in a similar situation near Oxford).

Planorbis albus. Common. Often on Caddis-cases.

Planorbis parvus. Locally abundant: Burton Court, near Leominster.

Planorbis spirorbis. Abundant in a brook at Moccas, with many sub-scalariform specimens.

Planorbis vortex. Not uncommon: the canal: Tupsley, etc.

Planorbis carinatus. Not very common: the Canal: Tupsley.

Planorbis complanatus. Common: I have observed it eject red-coloured fluid on being put in boiling water.

Planorbis corneus. "Hereford," De Boinville: "near Leominster" (?): Hereford canal, but only fragments.

Planorbis contortus. Very common.

Physa hypnorum. Formerly very abundant in one pond near Hereford, but the late drought seems to have destroyed it.

Physa fontinalis. Common: var. *inflata* at Bullingham.

* *Limnæa peregra.* Abundant: a very "palustroid" variety near Hereford: var. *labiosa* not uncommon.

Limnæa auricularia. Two distinct forms; one, smaller and squarer, very abundant at Burton Court, near Leominster: the other larger, flatter, in many cases labiate, many others, again, tending towards *L. peregra*, with which it formerly abounded in Hereford Canal.

Limnæa stagnalis. Two distinct forms; one, very abundant in Hereford Canal, slender, thin, and small, whereof I have found the mons. *scalariforme;* the other, at Tupsley, much larger, stouter and finer.

* *Limnæa truncatula.* Common. Very abundant in the Wye at Hereford: var. *elegans* (but usual colour) in the Frome. I have found it on the Ffwddog on the Black Mountains in very tiny rills: doubtless these are the hosts of the sheep-fluke.

Limnæa glabra. Rare near Tupsley: (very common near Hay, just over the Herefordshire border).

* *Ancylus fluviatilis.* In nearly every stream.

Ancylus lacustris. Widely distributed, but nowhere very abundant.

[*Testacella haliotidea.* Very rare: "Burghill," T. A. Chapman.

* *Arion ater.* Very common.

* *Arion hortensis.* Very common.

* *Arion bourguignati.*

* *Amalia gagates.*

* *Amalia marginata.*

* *Limax agrestis.* Common.

* *Limax maximus.* Not very common: Doward Hill.

* *Limax arborum.* Not very common: Doward Hill].

Succinea putris. One of our commonest and most widely distributed species. Sometimes near to *S. virescens* on horse-radish at Ross, vide *Helix rufescens* and *H. hortensis.*

Succinea elegans. Very common. I have seen this species floating.

* *Vitrina pellucida.* Common. Seems more abundant in spring. Does it bury itself to grow during the summer and autumn? Very little, if at all, affected by the cold.

* *Zonites cellarius.* Very common.

* *Zonites alliarius.* Rather rare: Ross: Llanwarne.

Zonites glaber. Not very common.

* *Zonites nitidulus.* The commonest species; also var. *nitens.*

* *Zonites purus.* Common. Also var. *margaritacea.*

Zonites radiatulus. Under bark on willow-trees. Doward Hill. Dormington.

* *Zonites crystallinus.* Not uncommon among dead leaves. Rotherwas, Backbury Hill.

Zonites fulvus. Not uncommon among dead leaves. Rotherwas; Backbury Hill.

Helix aculeata. Not uncommon. Among dead leaves, especially on stones among dead leaves. Backbury Hill; Rotherwas: Dormington: Breinton.

* *Helix aspersa.* Very common.

* *Helix nemoralis.* Very common; also vars. *castanea* (especially on the limestone), *carnea*, *libellula*, *bimarginata* (rare).

* *Helix hortensis.* Very common, but apparently not on the limestone; with vars. *albina* (on horse-radish, vide *H. rufescens*), *pallida incarnata*, *lutea* (very common), *arenicola.*

* *Helix arbustorum.* Not uncommon: Doward Hill: near Hereford.

* *Helix Cantiana.*

Helix rufescens. Very common. Apparently not on the limestone; with vars. *alba* (very common; the

only form at Ross on horse-radish, vide *H. hortensis*, *Succinea putris*), *rubens* (Hereford, not very common), *minor* (common).

* *Helix hispida*. Common. Many forms lead to the var. *concinna*.

* *Helix fusca*. Very local. Doward Hill.

* *Helix caperata*. Very common; with vars. *obliterata*, *fulva*, *Gigaxii*.

Helix ericetorum. Local, but abundant at Burghill.

Helix rotundata. Very abundant.

Helix rupestris. Very local, but abundant at Doward Hill in cracks in the cliff, among grass, dead leaves, etc.

Helix pygmæa. One specimen among dead leaves at Rotherwas.

* *Helix pulchella*. Not uncommon. Dinedor, Backbury Hill, etc. Mostly among dead leaves.

* *Helix lapicida*. Local and uncommom. Doward Hill: Dormington.

* *Bulimus obscurus*. Fairly common. Doward Hill: Breinton: Dormington.

Pupa secale. Local, but very abundant on the Doward Hill: also at Dormington.

* *Pupa ringens*. Not very common: Doward Hill.

Pupa umbilicata. Not uncommon. Doward Hill: Dormington.

Pupa marginata. Not uncommon. Doward Hill: Dormington.

(Note.—The Doward Hill and Dormington are both on the limestone.)

Vertigo. This genus seems conspicuous by its absence. Doubtless there are more than two species. Can any reader give me any hints to find them?

Vertigo edentula. Dinedor: Dormington.

Vertigo antivertigo. Dormington.

* *Clausilia rugosa*. Very common; also vars. *gracilior*, *tumidula*.

* *Clausilia laminata*. Very rare. Doward; Dormington; "Leominster;" only single specimens.

* *Cochlicopa lubrica*. Very common.

Cochlicopa tridens. Rare. Backbury Hill, among *Mercuriale perennis*.

* *Achatina acicula*. Very rare. Among dead leaves on Backbury Hill (only two specimens).

* *Carychium minimum*. Common among dead leaves. I have found this and many other species in abundance by shaking dead leaves over a sheet of paper or a cloth, or by bringing home bagfuls of rubbish for more leisurely examination.

* *Cyclostoma elegans*. Common.

In conclusion I may mention that the localities quoted are either parishes, or well-known woods, hills, or houses; also, if any reader would care to know the more exact locality of any species, I shall be most happy to render all the assistance in my power; and should be glad if anyone would inform me of any sins of commission and omission he may know of.

A. E. Boycott.

The Grange, Hereford.

NOTES ON NEW BOOKS.

The Horse, a Study in Natural History, by William Henry Flower, C.B. (London: Kegan Paul & Co.). This is one of the now famous modern-science series of books, edited by Sir John Lubbock, and issued by the above firm. They are all well got-up, printed with clear good type on good paper. The horse is a favourite animal all over the world, but nowhere more so than in England, and there is nobody more capable of writing about its anatomy and zoological history than Professor Flower. Its genealogical descent is better known than that of any other mammal, so that the horse is the animal most referred to in support of the theory of Evolution. The bones of its legs are a museum of ancestral organs, many of them now disused, others having been extraordinarily developed at their expense. Into all these matters Professor Flower enters in detail in the book before us, which is practically a little monograph upon the horse. The student of natural history could not study a more delightful book. It is written in plain and practically untechnical language. It contains only four lengthy chapters, which are as follows: "The Horse's Place in Nature—its Ancestors and Relations"; "The Horse and its nearest existing Relations"; "The Structure of the Horse, chiefly as bearing upon its Mode of Life, its Evolution. and its Relation to other Animal Forms—the Head and Neck"; "The Structure of the Horse—the Limbs." The work is embellished by twenty-six telling illustrations.

The Realm of Nature, an Outline of Physiography, by Dr. H. R. Mill (London: John Murray). This is by far the best handbook to physical geography in our language. It contains nineteen coloured maps, and sixty-eight illustrations, and appendices which give an account of the most important instruments used in determining physiographical questions. The last appendix is very usefully devoted to explanations of the derivations of scientific terms. There are seventeen chapters, at the end of each of which is a list of books of reference. The wide range of Dr. Mill's book may be gathered from the titles of the chapters, which are as follows: "The Study of Nature"; "The Substance of Nature"; "Energy, the Power of Nature"; "The Earth a Spinning Ball"; "The Earth a Planet"; "The Solar System and Universe"; "The Atmosphere"; "Atmospheric Phenomena"; "Climates of the World"; "The Hydrosphere"; "The Bed of the Oceans"; "The Crust of the Earth"; "Action of Water on the Land"; "The Record of the Rocks"; "The Continental Area"; "Life and Living Creatures"; "Man in Nature." Dr. Mill's manual ought to be in every library. It is a work not only to be read, but to be referred to at all times.

Manipulation of the Microscope, by E. Bausch (London: W. P. Collins). We are glad to see this

little manual circulating in this country. It is just the book we are often asked to recommend: full and clear in its detailed explanations. The headings of the chapters are as follows: "Simple Microscopes"; "The Compound Microscope"; "Objectives and Eye-pieces"; "Requisites for Work"; "How to Work"; "Advanced Manipulation"; "To select a Microscope"; "Sub-stage Illumination"; "Care of a Microscope," and Appendix.

The Optics of Photography and Photographic Lenses, by J. Traill Taylor (London: Whittaker & Co.). The author has for many years been editor of the "British Journal of Photography," so that no other man is better capable of writing such a useful manual as that before us. It is eminently practical, and all users of photographic lenses, both professionals and amateurs, will be thankful to possess it. Indeed there is scarcely a single detail which photographers of all classes have to be acquainted with in the prosecution of their art, which is not here clearly and fully set forth. The following enumeration of the chapters will give our readers some idea of Mr. Taylor's praiseworthy little book: "What constitutes Photographic Optics—Nature and Properties of Light"; "Photographic Definition, Real and Ideal—Forms of Single and Achromatic Lenses"; "The Cause of an Inverted Image"; "Spherical Aberration"; "The Nature and Function of the Diaphragm or Stop"; "Properties of Deep Meniscus Lenses—Compensating Single Lenses;" "The Optical Centre of Single Lenses"; "The Optical or Focal Centre of a Combination"; "Single Achromatic Lenses"; "Distortion, its Nature and Cure"; "Non-distorting Lenses"; "Wide-angle Non-distorting Lenses"; "Portrait Lenses;" "Rapid Landscape, Group, and Copying Lenses"; "Universal Landscape Lenses"; "Flare and the Flare Spot." The book contains sixty-eight illustrations, and is usefully supplied with a copious index. We cordially commend it to all those of our readers who are interested in the science and art of photography.

Air and Water, by Prof. Vivian B. Lewes (London: Methuen & Co.). This is a well-written, interesting little book, one of the university extension series. The author very successfully brings before his readers the wonderful changes going on in our atmosphere, and the still more marvellous work which water performs in our nature. Prof. Lewes writes very largely from a hygienic point of view. Readers will find this little work useful at any time as a handy book of reference on subjects connected with air and water. The contents are as follows: "The History of the Atmosphere"; "The chief Constituents of the Atmosphere"; "The minor Constituents of the Atmosphere"; "The local Impurities of the Atmosphere"; "The Causes which tend to keep the Composition of the Atmosphere constant"; "The Air of enclosed Spaces and Ventilation"; "Water and its Composition"; "The Determination of the Composition of Water"; "The Properties of Water"; "The Circulation of Water in Nature"; "The Impurities of Water"; "The Purification of Water."

Tenth Annual Report of the United States' Geological Survey, 1888–89 (Washington: Government Printing Office). We have to acknowledge two more large and handsomely got-up volumes, sent us by the American Government, in striking contrast with the beggarly niggardliness with which our own hides the lights of its geological surveyors under a bushel. Besides the Report of the Director, these volumes contain the following memoirs:—"General Account of the Fresh-water Morasses of the United States, with a Description of the Dismal Swamp District of Virginia and South Carolina," by Professor N. Shaler (this paper is profusely and excellently illustrated); "The Penokee Iron-bearing Series of Michigan and Wisconsin," by R. D. Irving and C. R. Van-Hise (numerous coloured maps and rock-sections); "The Fauna of the Lower Cambrian or Olenellus Zone," by C. D. Walcott (illustrated by fifty excellent plates, besides woodcuts). This is one of the handsomest volumes the Survey has hitherto published. One volume of the *Tenth Annual Report* is entirely devoted to the subject of "Irrigation."

Fifth Report of the United States' Entomological Commission, on "Insects injurious to Forest and Shade Trees," by Dr. A. S. Packard (Washington: Government Printing Office). This is another of the valuable volumes issued by the American Government, the work of one of the most distinguished entomologists of the day. It is illustrated by 360 woodcuts and 40 full-page plates, many of them coloured. All the insects, chiefly Lepidoptera, which injuriously affect forest-trees are here figured and described in every stage of their development. The trees whose insect enemies are described are the oak, elm, hickory, black walnut, butternut, chestnut, locust-tree, maple, cotton-wood, lime, birch, beach, wild cherry, plum, thorn, crab-apple, mountain ash, ash, willow, hackberry, alder, sycamore, pine, spruce, fir-tree, larch, juniper, cedar, and cyprus. It is one of the most admirable volumes in every respect the U.S.A. Commission has ever turned out.

Annual Reports of the Smithsonian Institution, vols. 1887–89 (Washington: Government Printing Office). These bulky volumes, which run to over seven hundred pages each, are exceedingly useful to a scientist, on account of their admirable progress in scientific work for each year, as well as their full and useful bibliography. In addition, each volume contains a well-written review of some particular subject, or translations of papers and addresses from the most important foreign papers of each year. No more entertaining and useful scientific annual appears.

Systematic List of British Oligocene and Eocene Mollusca in the British Museum of Natural History, by B. B. Newton; *Catalogue of British Hymenoptera*

in the British Museum, second edition, part i., Andrenidæ and Apidæ (London: printed by order of the trustees). We are proud of these two volumes. The trustees of the British Museum are the only authorities who recognise what the Americans have long found out, that science is democratic and not oligarchic. They distribute their valuable volumes with a free hand to every free library and scientific journal. Mr. Bullen's volume will be found of especial value to geologists. It deals practically with the late Mr. Edwards' collection of mollusca. Mr. Edwards was one of the members of the "London Clay Club," founded in 1838 for the purpose of collecting and describing and illustrating the eocene mollusca. His collection is now in the British Museum, and Mr. Bullen's work is an account of it. The volume on British Hymenoptera is accompanied by a "Catalogue of the British Bees in the British Museum," by Frederick Smith, a new issue. Very few people are aware that the total number of species of British bees known at present is 211. It is hardly necessary to say that Mr. Smith's catalogue is accurately and well done.

The Medical Annual and Practitioner's Index, 1892 (Bristol: John Wright & Co.). This volume has gained immensely both in bulk and value since its first appearance ten years ago. It now runs to close upon 700 pages, is abundantly illustrated both by woodcuts and coloured plates, and is contributed to by most of the chief medical writers of the day. Dr. Ruffer's paper on "Recent Advances in Bacteriology" will be read by many other than medical men. We have looked in vain in it for a paper on the "Natural History of Influenza." The volume contains a list of the principal medical books of last year.

NOTES ON THE INFUSORIA.

By Bernard Thomas.

II.—Flagellate Infusoria.

The Infusoria proper consists of a single group of unicellular animals. The Diatoms, Desmids, Rotifers and others, either plant-forms or multicellular animals, have been rejected by the zoologist, and referred to their respective classes in the animal or vegetable kingdoms.

Unicellularity is the leading character of the Protozoa, and while the Amœba represents the lowest class, the Infusoria is the highest class of that sub-kingdom. The latter are therefore described as a class of the Protozoa furnished either with one or two long motile filaments (flagella), with several delicate vibratile filaments (cilia), or with non-vibratile filaments furnished with suckers (tentacles).

The following is adopted as a good working classification:—

(1.) Flagellata.*
(2.) Cilio-flagellata.
(3.) Ciliata.
(4.) Suctoria (Acinetæ).

(1.) The Flagellata have one or two long delicate filaments called *flagella;* when two exist, they usually arise from the same end, and the region from which these organs spring is usually called the oral or anterior end. There is often no mouth, but only an oral region, usually placed near the base of the flagellum, at which the food is introduced. Very generally there is a nucleus, a contractile space, and sometimes a little red pigment body (the so-called eye-spot or red ocellus).

We may roughly divide the Flagellata into two groups; firstly, the free-swimming isolated forms, and secondly, those that live in colonies.

1. *Astasia limpida* (Fig. 43). The length of the species is given in the "Micrographic Dictionary" as the five-hundred-and-fiftieth of an inch. While swimming, fully extended, it glides along with its long flagellum stretched out in front of it, and this organ may be seen to move about as it swims. It may now be described roughly as shaped like a pear, of which the flagellum forms a somewhat long stalk. The anterior or oral region, from which the flagellum

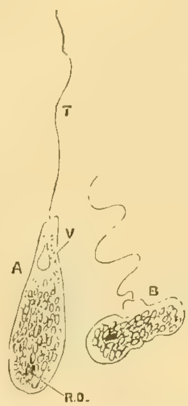

Fig. 43 —*Astasia limpida*. A, extended, showing flagellum (T), vacuole (V), and eye-spot (R O); B, contracted.

springs in a slight notch, is pointed, the posterior part blunt. The protoplasm in the former region is clear and contains a vacuole, while the remaining substance is granular, sometimes with large well-defined particles crowded close together. In some specimens there is a little reddish body at the posterior end, similar to the eye-spot found in certain of the Algæ. The flagellum is very long, and seems to be used as a tactile organ, feeling everything that comes in its way.

From the observations of Bütschli † it appears that

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* Claparède and Lachmann.
† "Carpenter on the Microscope," p. 506. 1881

this organism has a true mouth for the reception of food. Sometimes it stops swimming and rapidly changes its form and becomes irregular in outline (Fig. 43 *b*) while the long flagellum is seen to wave about in the water. The ectosarc seems eminently contractile, like that of the Amœba or Euglena. We shall see that the contractility of the ectosarc varies greatly in the different species of Infusoria, in Paramœcium it is not contractile, though not very resistant to objects that may be pressed against it, while in Coleps the ectosarc is cuticular.

The resemblance of Astasia to Euglena, presently to be described, is very striking indeed. Ehrenberg and Dujardin classed both forms together into the same family.

2. *Euglena viridis* is by many considered a plant, by others an animal. Like a plant, it contains green chlorophyll, and it may be noted that it bears a general resemblance to the free-swimming Zoospores of certain Algæ.

Its length varies from the thousandth to the two-hundred-and-fiftieth of an inch. It is exceedingly common in pond-water and may often be found in great multitudes in the green water found at the bottom of manure heaps. When fully extended, it is seen to be somewhat spindle-shaped; one end is clear, and contains a minute red angular body, the red ocellus or eye-spot. It is difficult to say what is the function of this bright particle, but it is found in the Zoospores, as well as in many of the free-swimming green Flagellata which may be grouped collectively as Flagellate Algæ. The rest of the protoplasmic cell contains chlorophyll corpuscles. This green colouring-matter is not diffused throughout the general substance, but collected in little green masses of protoplasm (chlorophyll corpuscles) as in the higher plants. In the centre of the cell there is sometimes a large round body, resembling in appearance the pyrenoids seen in Desmids, Zygnemaceæ, and also probably in the Zoospores. Although it occupies the centre of the cell it seems too well-defined for a nucleus, and if it be so, is green chlorophyll-containing.

The anterior end is slightly notched, the posterior end is prolonged into a tail and is clear and colourless. Sometimes the protoplasm is stuffed with granules which look like starch grains but do not stain blue, but a deep brown, with iodine. The motile filament, springing from the notch before mentioned, is longer than the body, and furnished with a small knob at the free extremity.

Euglena is seen to frequently change its form in a manner somewhat similar to Astasia, only there may be noted this difference: in Astasia the anterior extremity participates less than the remaining protoplasm in this change, while in Euglena the anterior and posterior ends both seem the less motile. Unlike many other Flagellate Algæ, *Euglena viridis* has no cell-wall as have its allies *Phacus* and *Euglena pyrum* There are other allies of *Euglena viridis* which will only be briefly mentioned; among these are *Euglena acus*, *E. pyrum*, and *E. longicauda*.

3. *Euglena longicauda*, sometimes called *Phacus longicauda*, is of somewhat larger size than the preceding. In the "Micrographic Dictionary" it is said to be from the one-hundred-and-eightieth to the one-hundred-and-twentieth of an inch. Its movements are slow, and it has a peculiar habit of twisting its body. The ectosarc is marked obliquely with lines resembling the myophan striæ of the Ciliata.

4. *Euglena pyrum*, unlike the two other Euglena, is furnished with a firm cell-wall formed from the ectosarc. This case is sometimes found empty, and then delicate spiral markings can be seen. In size it may vary from the thousandth to the eight-hundred-and fiftieth of an inch, so that it is much smaller than *E. viridis*.

5. *Phacus pleuronotes* is about the six-hundredth of an inch in length. In one aspect it is broad, roughly oval, but broader near the base, in another view it is thin and narrow, so that it may be described as plate-like. It rolls lazily round on its long axis as it swims, presenting alternately the broad and narrow aspect to the observer. The anterior part is cleft, and from this a delicate flagellum arises. The posterior end is prolonged into an obliquely directed tail. The cell-wall is marked with striæ, the strongest of which radiate from the cleft to the tail.

In the interior there is an eye-spot, situated near the origin of the flagellum. There are usually two vacuoles, which do not appear to be contractile, the smaller of which is near the red ocellus. Chlorophyll corpuscles more or less fill the rest of the interior. Sometimes there are one or two oval, colourless, highly-refractive bodies with concentric markings, and which do not stain with iodine.

The two little organisms Doxococeus and Chætoglena are often found together in pond-water.

6. *Doxococcus ruber*, something bigger than the two-thousandth of an inch in diameter, is round and rolls over and over as it swims. The thick cell-wall is of a reddish-brown hue and hides the protoplasm with its green corpuscles. Through a hole in the case surrounded by a ring the flagellum protudes. By the pressure of the cover-glass we may easily crush the brittle cell-wall, and in this way expose the protoplasm with its corpuscles and red eye-spot.

[The other figures will appear in next paper.—Ed.]

BRITISH POISONOUS PLANTS.

CONSIDERING the extent of our native flora, we are happily exempt from many poisonous species, and those plants that are known as injurious are either not very common, or are easily recognised. In our immediate neighbourhood, with the exception of some scattered plants of *Solanum dulcamara*,

whose scarlet berries have certainly a very tempting appearance, there is no poisonous plant to whose questionable attractions children would readily fall victims, for even their inveterate curiosity would scarcely lead them to experiment upon hemlock or foxglove, at any rate in their own persons. Yet, although the species usually regarded as British poisonous plants, are neither numerous nor very common, if we except those of the Umbellate family, many tribes contain species that are more or less poisonous, it being rather a question of the intensity of certain noxious properties than their entire absence, and families that are known to be distinctly poisonous in other parts of the world may well be looked upon here with suspicion, and treated accordingly.

The Euphorbiaceæ, a very poisonous tribe in warmer countries, is represented in our flora by species too insignificant to be injurious in any marked degrees.

The Leguminoseæ, again, are as a whole (according to Lindley) to be reckoned poisonous, and strange though it may seem, those species that form such important articles of food for man and animals as the pulse and fodder plants are just so many exceptions to the rule, yet amongst our native species there are none that are injurious. It would appear that the active principles of plants gain or lose in intensity according to the climate in which they naturally grow, and for this reason plants whose home is in warm and tropical climates where light as well as heat is so much stronger than with us, are characterised by more powerful secretions, whether for good or evil; their flowers are more strongly-scented, and their fruits are more full of flavour and sweetness than ours. It is said that when such plants are grown in our hothouses, their peculiar properties suffer considerable diminution, the reason being chiefly that the light, that all-important factor in the production of secretions, is so much less intense than in their native habitats. Many powerful poisons are to be found in the Figwort order (Scrophularineæ), but with the exception of Digitalis and Scrophularia our native plants are probably harmless.

Our truly poisonous plants are met with principally in the Orders Ranunculaceæ, Umbelliferæ, Solanaceæ. To begin with the Ranunculaceæ;—all the plants of this family are full of an acrid principle, but *Ranunculus acris* is specially distinguished by name for the virulence of its blistering sap. Though it abounds in rich pastures, and is popularly supposed to impart its own deep yellow to the butter produced by the cows grazing there, it is really left entirely alone by them, and with reason, for it is the most acrid plant of the genus; yet its injurious properties are dissipated when it is dried with the hay.

Anemone nemorosa is also refused by both horses and cows because of its acrid juice; but goats, who seem able to find "good in everything," eat it, as do sheep, though it sometimes disagrees with them. But how much wider is the discretion exercised by animals than that of human beings in respect of what is good and wholesome for food. Cows, as we have seen, eschew the tempting golden buttercups; and animals, especially in a wild state, are able, in virtue of their wonderful gift of instinct, to feed unharmed amongst vegetation that would cause injury, or even death to them if they partook of it. Their instinct seems to lead them unquestioningly to refuse the evil and choose the good; while man, with his higher endowment of reason and intelligence, must perforce prove all things by experience before he can be satisfied as to their character. The instinct of domesticated animals, however, does not always serve them as an unerring guide, or we should not hear now and then of cattle and horses being poisoned by eating the foliage of the yew, or the leaves of the more deadly cowbane.

But to return. The two Hellebores have no very good repute, though once accounted specifics for madness. Their generic name comes to us from the Greek, and though the species that was accounted poisonous by the ancients is not included in our flora, the two that are must be looked upon with suspicion. But the poisonous plant *par excellence* of the Ranunculus family is *Aconitum napellus*. It was considered by the ancients as the most prompt of all poisons, one indeed that

> "Swift as quicksilver, courses through
> The natural gates and alleys of the body."

Its generic name is thought to have been derived from *aconitos*, without a struggle, while *napellus* alludes to the form of the roots. Its popular appellation of wolfsbane indicates its virulent nature, as it was formerly used to poison wolves, by scattering or sprinkling the acrid juice over pieces of raw flesh. The whole plant, but especially the root, is poisonous, and deaths have frequently occurred through the latter being mistaken for horse-radish, though the two bear little resemblance to each other. The singular flower of *A. napellus*, not inappropriately named monkshood or friar's-cap, is known to all who possess a garden. We have probably been familiar from childhood with the appearance of the overarching sepals that form the "hood," and with the long-stalked nectaries into which the hindmost petals are transformed, for what child does not love to discover the pair of doves yoked to the pretty chariot within? The rootstock of *A. napellus* is black, and shaped something like that of a carrot. By the way, does Keats's epithet, "tight-rooted," refer to the hard texture of the root, or to the tenacity with which it holds to the ground?

> "Go not to Lethe, neither twist
> Wolfsbane, *tight rooted*, for its poisonous wine."

One may well inquire what it is that makes this plant such a deadly, acrid poison, and how and why some plants form out of the elements that are the

common food of all, the starch, sugar, gum, etc., that are good and wholesome, and others the alkaloids and bitter, acrid principles, the "poisonous wine" of the poet? Alkaloids, of course, partake somewhat of the nature of the alkalis soda and potash that are found in all vegetables, and mostly occur in combination with the acids of the plant; they are said to be the most remarkable substances discovered by modern chemistry, and are the active principles of those plants in which they are found. But although they are, so to speak, the very essence of the plant, they are not necessary to its life and well-being, but are waste products, substances that the plant wants to get rid of, for they take no part in the formation of its tissues. They are, therefore, usually removed from the younger and most active parts, and are stored up as secretions in bark, fruit, seeds, etc., in the case of Aconitum chiefly in the root. Vegetable alkaloids are composed essentially of carbon, hydrogen, and nitrogen, the greater number also contain oxygen, but nitrogen is invariably present. These poisonous principles are most energetic in their action on the

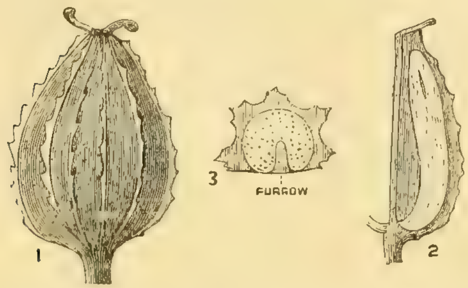

Fig. 44.—1, fruit of *Conium maculatum* (enlarged). 2, longitudinal section of one carpel and seed; 3, transverse section of same, showing the deeply-furrowed albumen.

human system, and many are used as medicines which in large doses would be poisonous. They are named after the plants in which they are found: Belladonine, Atropine, Morphine, Nicotine, Theine, etc., and the very powerful alkaloid that is obtained from *Aconitum napellus* is called aconitia or aconitine. Aconite is, it scarcely need be said, one of the most valuable of medicines, and has been called the "homœopathic lancet" on account of its wonderful power of reducing fever, indeed it is to the introduction of this drug into the modern practice of medicine, that we are largely indebted for the more rational treatment of fevers that now prevails. It is to be noted that alkaloids in their most concentrated form are crystalline and colourless—can the Raphides that abound in some plants of the Lily tribe be of this nature, for the Scillas and Colchicums have an undoubtedly poisonous character? Aconitine belongs to the class of narcotic irritant poisons.

Next in order, and not less pernicious in their effects upon man and animals are the three or four members of the Umbellate family that possess noxious qualities: these are *Conium maculatum*, hemlock; *Cicuta virosa*, water-hemlock or cowbane, and *Œnanthe crocata*, hemlock dropwort, or dead-tongue. *Œthusa cynapium* is also poisonous, and from having been mistaken and eaten for a most useful and wholesome member of the same family has been named "fool's-parsley." *Conium maculatum* is indigenous, and has long been used in medicine; its nauseous smell when bruised ought to be enough to warn any one from it. Unlike *Aconitum napellus*, it is in the fruit that the poisonous properties of hemlock are concentrated, and, considering that it is an annual plant, it is only to be expected that they would be stored up in the albumen of the seed. The fruit, though resembling that of

Fig. 45.—Section of flower of Monkshood.

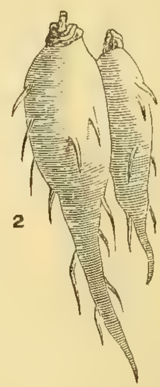

Fig. 46.—Napiform roots.

cowbane and celery-apium, differs from them in its deeply-furrowed albumen. The active principle is *Conia*, an oily alkali with a peculiar mouse-like odour. Hemlock being the state poison of Athens, was that used to compass the death of "that best, wisest, and most just of men," Socrates. The action of this narcotic irritant poison is to paralyze the muscles of respiration so that death is comparatively painless. Plato relates in the Phædo how the servant who brought the poisoned cup to Socrates told him to walk about until his legs felt heavy, and then lie down,—"the drink," said he, "will do the rest;" and how gradually he grew cold and stiff from the feet upwards, and said to those around him that when the cold reached his heart, he should depart; then, uncovering his face, he gave that famous last

command to Crito, "We owe a cock to Æsculapius, discharge it and do not neglect it;" and in a little time had ceased to breathe.

The Solanum or Potato order is made by Bentham to include *Datura stramonium*, the thorn-apple, *Hyoscyamus niger*, henbane, *Solanum dulcamara*, bittersweet or nightshade, *S. nigrum* and *Atropa belladonna*, dwale or deadly nightshade. All the plants of the order possess narcotic properties, and some are very poisonous; one of their marked characteristics is that of causing dilatation of the pupil of the eye, hence the specific name of *Atropa belladonna*, "fair lady," as it was, and possibly still is used to enhance the beauty of the eye. As Datura is scarcely to be considered as naturalized in England, though sometimes met with in the southern counties, we will pass on to henbane, *Hyoscyamus niger*, with the purple veinings on its pale yellow corolla and its pretty box-like fruits set within the persistent calyx, and its large hairy irregularly pinnatifid leaves. Perhaps it is just as well that this plant confines itself for the most part to the neighbourhood of ruins, and frequents stony and waste places. Listen to the estimation in which it was held by the ghost in "Hamlet!"

> "Thy uncle stole
> With juice of cursed *hebenon* in a vial,
> And in the porches of mine ears did pour
> The leperous distilment."

The properties of Hyoscyamus, like the rest of its family, are decidedly narcotic, and it is a valuable soother of pain and aid to sleep when judiciously administered. *Solanum dulcamara* is a more common plant. Its tufts of purple blossom with their cone of yellow anthers are like miniature potato flowers, and the bright red berries the "ruby grapes of Proserpine" that succeed them are very attractive; according to Bentley they are in rare cases poisonous, and Balfour declares that the berries of *S. nigrum* are edible. They are eaten in the Ukraine, and in Ascension Island are used in the making of plum-puddings for the soldiers of the garrison! It is certain, however, that an alkaloid called Solanine is present in both plants, as indeed it is, in a less degree, in the potato plant. Some derive the name of Solanum from *solor*, to assuage or comfort (the tobacco plant belongs to the order), but it is perhaps wiser not to seek too much consolation from members of this family. The ominous name of Atropos, that one of the three fatal sisters whose office it was to cut the thread of life has been bestowed upon its most dangerous member, *Atropa belladonna*, dwale or deadly nightshade. Dwale may signify mourning and woe (Fr. *deuil*), or perhaps the sleep that it induces, while nightshade suggests the temporary blindness caused by its juice. Each designation sounds a warning note, and indeed the alkaloid Atropine is a most powerful poison, that forms itself into innocent-looking, white, silky crystals, devoid of smell, but with a bitter taste. The cherry-like berries of the deadly nightshade have too often proved a fatal temptation to children, so that one cannot be sorry that it is not a common plant in the north. The flower is of a lurid purple, and the berry, like that of henbane is surrounded by the persistent calyx.

The foxglove healeth all wounds, "Aralda tutte le piaghe salda," says the Italian proverb; nevertheless it must be classed amongst our poisonous plants, though it is a valuable medicine, and was much used in the middle ages for staunching wounds. The foxglove, *Digitalis purpurea*, belongs to the Scrophularia family, and is certainly too well-known to need description. Its poisonous, bitter principle is called Digitaline, and on account of its narcotic properties is much used as a sedative in diseases of the heart; indeed the great value of the poisonous principles of plants in medicine seems to afford an answer to the question one is at times ready to put as to why there should be poisonous plants at all. Their real danger is, of course, only to the ignorant, and children ought always to be warned against eating tempting-looking berries that they may happen to find.

Lactuca virosa and *L. scariola* may be named as highly-poisonous members of the Composite family, whose milky juice acts like opium.

Daphne mezereum, spurge laurel, of the order Thymelaceæ, is yet another highly-poisonous plant to be added to the list. Daphnin is found in all parts of the plant, but especially in the root, bark, and bright red berries. In a paper on poisonous plants the Fungi must not be overlooked, as the number of poisonous species are many, and their dangerous properties extremely virulent. They contain much nitrogen, and are rich in phosphates. Bright-coloured fungi should, as a rule, be avoided, also those whose juice is milky, or that have a powerful odour, or an acrid, astringent, salt or bitter taste. With regard to fungi, it might be well to follow the example of the young French lady who, when invited to partake of some strange dish, declined, remarking that she only "ate her acquaintance," for even the common mushroom may be sometimes poisonous, and is avoided both in France and Italy.

M. D. D.

Hawkshead, Ambleside.

SECRETING GLANDS IN THE FEET OF FLIES.

In warm summer weather myriads of small flies, of the genus Hilara, may be seen in constant motion over streams of water; their movements are various and very difficult to follow. The males of these insects have the first, and in some species the second joints of the anterior tarsi much dilated. The first joint is the largest, and varies both in size and

shape, the most common shape being somewhat of an oval. Usually in flies the first tarsal joint is well supplied with muscles, nerves, tracheal vessels, and an apodéme, this latter extending to the terminal joint of the tarsus, but in the same joint, in *Hilara pilosa*, muscles are absent, the space which they should occupy being filled with large glands, from which well-defined ducts extend to the integument, on the inner side of the foot (Fig. 47). Some of the ducts in their course turn upon themselves, forming loops before penetrating the integument, which they do immediately above each large hair. The orifice of the duct is circular, and placed so close to the base of the hair that the minutest drop of fluid exuded would necessarily come in contact with it. I have not had an opportunity of examining the secretion, but it is most probably of a viscid nature, and like that given off from the pulvilli of flies. Similar glands I have found in the anterior tarsi of the water-beetle, *Asilus sulcatus*, which are in intimate connection with both the large and small so-called sucking discs. The use of this fluid has not been absolutely determined, but it is thought to be of service to the insect during the act of copulation.

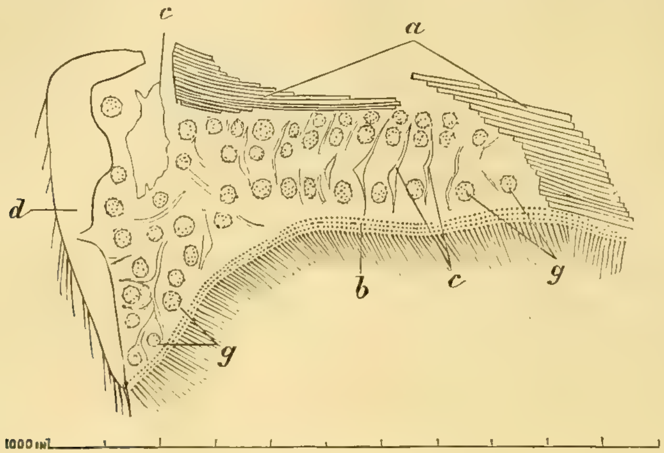

Fig. 47.—*Hilara pilosa*, longitudinal section through first joint of anterior tarsus of male; *a*, outer wall; *b*, inner wall; *gg*, glands; *d*, ducts.

The idea that the pulvilli or pads on the feet of flies act as suckers to enable the insect to walk in an inverted position on ceilings, etc., has not yet been eradicated from the minds of some people, though a sufficient proof has long been established showing that an adhesive fluid, exuded by the pulvilli, enables them to perform this feat. But where, and by what means, is this fluid elaborated? In Mr. Lowne's Monograph on the Blow-fly, it is stated that "a close sac fills the whole of the last four tarsal joints, and is lined with pavement epithelium; it secretes a perfectly clear, viscid fluid, which exudes from it into the pad and fills its cavity, as well as the hollow hairs with which its under surface is covered." Having tried to confirm this statement, I have failed to convince myself of its correctness, though the attempt has resulted in bringing out other facts which may be of some interest. The minuteness of the parts prevents satisfactory results being obtained by dissection, I have therefore made sections in various directions through both the tarsal joints and pulvilli of numerous flies, and have invariably found in the posterior portion of the pulvilli a number of secreting glands, but in no instance have I met with glands in any of the four last tarsal joints. The number of glands varies much in different species of flies, the most numerous I have met with are in the pulvilli of

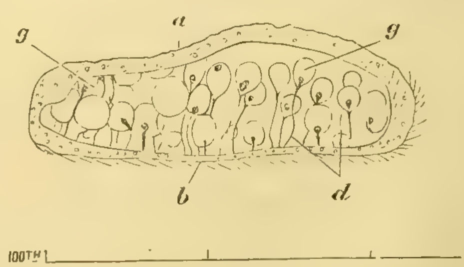

Fig. 48.—Longitudino-vertical section of pulvillus of *Sarcophaga carnaria*.

Sarcophaga carnaria, a troublesome fly of medium size with abnormally large flat pulvilli. Fig. 48 represents a portion of a longitudino-vertical section of *S. carnaria*. The upper wall (*a*) is arched, and formed of semi or half-tubes of pigmented chitin laid lengthwise close together, with the round side uppermost. The lower wall (*b*) is not parallel with the upper, but forms continuous curves in both longitudinal and transverse directions, causing the fine transparent hairs with which it is closely beset, to assume various angles. This irregular contour of the

under surface of the pads adapts them to any uneven surface on which the fly may alight, thus, only a portion of the sticky hairs would be brought into contact with the support at one and the same time. The structure of the upper wall is well suited to give both strength and elasticity to the pads. Internally, the posterior half of the pulvillus is nearly filled with a homogenous substance that stains with carmine and is partially separated into distinct portions by clear spaces (*c c*). In the midst of these partially isolated masses appear one or more glands, the nuclei of which take a deep stain (*g*). The ducts are very transparent, and not easily defined, except where they happen to cross a clear space. The anterior half of the pulvillus is broader and shallower than the posterior half, and contains no visible substance; if it has contained fluid, the alcohol used in preparation has possibly withdrawn it, or otherwise it does not take carmine stain. In similar sections from the pulvillus of the blow-fly, the fluid has become consolidated, fills about two-thirds of the depth of the pad, and takes a faint stain with carmine.

The hairs appended to the lower wall of the pulvillus are devoid of pigment, and so transparent that I have been unable to detect any lumen, though I have tried to coax air into them, neither have transverse sections revealed any opening.

From the examination of the feet of many flies with similar results, I am led to the conclusion that the viscid fluid used by the fly for its support, either in an inverted or vertical position, is elaborated in the pulvilli, and in them alone.

WM. JENKINSON.

SCIENCE-GOSSIP.

WE deeply regret to announce the death of Mr. Henry Walter Bates, F.R.S., who died recently from influenza and its complications, at the age of sixty-six. He was distinguished as a traveller and naturalist, and very well known for his twenty-seven years' secretaryship of the Royal Geographical Society. As a youth he was an enthusiastic botanist and entomologist, and the country around Leicester—his birthplace—was well known to him through his frequent expeditions. At the age of twenty-three he went off to the Amazon, and during eleven years continued his study and collections among the natural history riches of that region. In 1863 he published "The Naturalist in the River Amazon," and for the Linnæan Society's "Transactions" he wrote "Contributions to an Insect Fauna of the Amazon's Valley."

ANOTHER leading scientist has joined the majority in Professor Thomas Sterry Hunt, who died in New York on February 12th, after an attack of influenza. He was born in 1826, and began his scientific career, at the age of twenty, in the laboratory at Yale. As chemist and mineralogist to the Geological Survey of Canada he rendered valuable service. In 1872 he was appointed to a chair in the Massachusetts Institute of Technology; in 1859 he was elected F.R.S., and in 1881 received the LL.D. of Cambridge. His best known writings are "Chemical and Geological Essays," "Mineral Physiology and Physiography," and "Systematic Mineralogy."

AT a meeting of the Edinburgh Royal Society, held recently, Dr. Ralph Copeland, Astronomer Royal for Scotland, read a communication on the new star in the constellation "Auriga." Dr. Copeland said a feature of the new star was its rapid rise to its maximum of brightness and its equally sudden decline. Of two temporary stars discovered in recent years one had broken out in "Nebulæ," and was comparatively little observed, but the second, which appeared in 1885 in Andromeda, was thoroughly examined. There was very little of any distinctive features in it, and they might argue that these new stars were spectra not unlike those represented in "Nebula Andromeda." No full data had yet been got as to the suddenness of the appearance of the present new star. It was generally considered that the telegram which had been received from America on the subject did not mean that the star had actually passed through a maximum of brightness on 20th December last, but that on that date it was brighter than on the 10th or 1st of the month. The writer of the anonymous post-card on the subject was Dr. Thomas D. Anderson, Edinburgh, who was almost certain he had seen the star at 2 oclock a.m. on 24th January last. At that date it did not occur to him that it was a new star, but on February 1st it flashed on him, and the discovery was made, and he hoped Dr. Anderson's success would be the means of making amateurs persevere in their endeavours. On the 1st inst. a spectroscope had revealed bright lines on the star. The tackle of the Observatory here had been taken to Dunecht, and observations made there, and he had also made observations. On the 9th inst. he obtained the positions of the lines. They were 656·2; 595·0; 562·0; 533·6; 518·0; 502·3; and 500·5. 500·5 was the place where the great Nebulæ lay. 502·3 was one of the best measurements he made. Other positions were 494·0, 486·1, 449·6, and 447·6. Three of these lines pointed to nebulous matter burning in the star, but as a matter of fact that was not the case. He had that morning received satisfactory results from Dunecht. Observations had been made there, and 308 measures of 71 lines in the spectrum had been secured, and there was no doubt of the positions of the lines. They saw at once from his measurements that hydrogen was represented by three lines, and they knew that nebulæ lines were wanting. The lines at 494 and 502 were not due to

nebulæ. 518 was perhaps due to magnesium oxide. It was thought the new star was closely allied to others, and was probably colder and older than them, From February 1st a set of estimates of its brightness on various dates up to the 11th had been made. There was a very marked increase in its brightness, and it fell down to the fifth magnitude on the Tuesday. He was fairly confident of its maximum of brightness on the Sunday. The observations of brightness tended to show a relationship more to a variable star than to a "Nova" burning itself out within a few weeks of its appearance. The most remarkable feature about it was the 502 line being so near the great nebula line. That had not been seen in spectra of variable stars.

AT the last meeting of the Society of Marine Engineers, a paper was read on "Initial Condensation," after which the following propositions were put before the meeting: 1. That range of temperature does not cause, but permits condensation; 2. That the increased initial condensation found with higher rates of expansion is due to increased work, and not to increased range of temperature; 3. That initial condensation may occur not only when steam is used at full pressure throughout the stroke, but even when no useful work is performed; 4. That the lessened initial condensation generally found with stage expansion engines is largely due to reduced range of temperature, but notwithstanding reduced range of temperature a stage expansion engine may condense as much steam as a single stage engine; 5. That conducting-cylinders do not of themselves cause initial condensation, the actual cause being the disappearance of heat and consequent liquefaction of steam in the performance of work; 6. That discordant results are almost certain to arise when the condensive surfaces are active up to their full capacity; 7. That instead of it being necessary to consider why initial condensation exists, it is often necessary to enquire why it is not greater.

WE have received from Professor Prestwich his admirable and suggestive paper illustrated with maps and specimens "On the Primitive Characters of the Flint Implements of the Chalk Plateau of Kent, with Reference to the Question of their Glacial or Pre-Glacial Age," with notes by Messrs. B. Harrison and De Barri Crawshay.

WE are pleased to receive the fourth report of the "Microscopical Society of Calcutta," which, owing to the possession of an active president, and an equally active secretary, J. Wood Mason Esq., and W. J. Simmons, now commands attention.

THE increasing interest in natural history is best shown by the new periodicals required to deal with its manifold questions. We have to announce and welcome the advent of another competitor for popular favour in "Natural Science," price 1*s*. An admirably printed and well got-up magazine, in which we are glad to see the names of several esteemed contributors of SCIENCE-GOSSIP appearing.

WE have received a pamphlet, beautifully printed and tastefully got up, entitled, "A Review of the work of the Leeuwenhoek Microscopical Club, Manchester, 1867–91." The title-page is illustrated with a beautiful photograph of Leeuwenhoek, from the engraved portrait by Anker Smith, in the 1800 edition of Leeuwenhoek's works, of Hoole, London.

THE "International Journal of Microscopy and Natural History" for January is unusually interesting. It is crowded with good matter, and has some excellent illustrations.

ONE of the most important natural history associations in this country is the "Transactions of the Yorkshire Naturalists' Union." Nothing more thorough has ever been turned out by any society. The parts deal with the botany, geology, climate, physical geography, entomology, &c., of the premier county, in addition to which there is a separate part by Mr. Robert Kidston on the Yorkshire carboniferous flora. These parts are published by Taylor Brothers, Leeds.

WE beg to call attention to the following second-hand scientific book catalogues, as very likely to prove useful to our readers:—Messrs. Wesley's No. 115 Catalogue of Works relating to Meteorology, Physical Geography, and Aeronautics; Messrs. Dulau's Catalogue of Works on Geology, 108 pages; and Mr. W. P. Collin's Monthly Catalogue of Books on Science and Natural History.

THE last number of the "Journal of the New Jersey Natural History Society" contains a useful paper on the "Molluscs of the Atlantic Coast of the United States South to Cape Hatteras," by Austin C. Aggar.

BARON FELDER, formerly Burgomaster of Vienna, has sold his great collection of butterflies to Lord Rothschild for 5000*l*. The collection is said to be destined for the British Museum. Baron Felder, who is seventy-eight years old, has parted with it for fear that otherwise after his death it would be broken up. The price is considered very low.

MR. LUDWIG MOND, the brilliant Swiss Chemist, has not only discovered how to dispose of ordinary coal smoke, but how to turn it into a highly profitable commodity. The statement is that by burning 125 tons of coal, at a cost of 31*l*., and making full use of it for steam raising purposes, he can at the same time secure, by a simple process he has invented, four tons of sulphate of ammonia from the smoke produced by the coal. The money value of this will be 48*l*.

AN American astronomer, Professor Chandler, of Harvard, has started the theory that the variable star

Algol—alpha Persei—owes its variableness to the fact that, together with a dark satellite, it revolves round a third and central body, which is also dark, in one hundred and thirty years. The orbit of the shining star Mr. Chandler calculates to be two thousand five hundred times as large as that of the satellite.

At the suggestion of Dr. Cesare Lombroso, the present distinguished occupant of the chair of Forensic Medicine and Psychiatry in the University of Turin, a "Psychiatrico-Criminological Museum" is about to be formed in that seat of learning. It is proposed, says the "British Medical Journal," to form a collection illustrating as far as possible the mental and physical characteristics of lunatics and criminals, and supplying the necessary materials for the scientific study of the various types of mental or moral abnormality. Among the objects collected will be skulls, skeletons, and brains of criminals, preparations of diseased and malformed organs, instruments for the study of insanity and remedies used in its treatment, plans of prisons and lunatic asylums, autographs of lunatics and criminals, materials for the geographical distribution and statistics of crime, &c.

We are pleased to welcome the "First Report of the Southport Society of Natural Science." The president's address is an excellent one, and the report contains papers on the "Geology of the neighbourhood," by E. Dickson; "A List of the Mollusca of the District, by G. W. Chaster; "A Paper on the Botany," by Henry Ball; and "A Report on the Local Foraminifera" (illustrated), by G. W. Chaster.

At the anniversary of the Royal Microscopical Society, the president's address was postponed until the next meeting. The president, Dr. Braithwaite, is one of the most distinguished of living muscologists, and he very appropriately selected as the subject of his address the impregnation and modes of reproduction in ferns and mosses. Diagrams in illustration were exhibited and explained, and specimens were also shown under microscopes in the room.

ZOOLOGY.

The Approaching Extinction of the Lapwing.—The remarks under the above heading in the March number of Science-Gossip recalled to me Mr. J. Cordeaux's statement before the Select Committee on Wild Birds' Protection, and which I have since looked up, and it runs as follows:—"Questioned by Sir D. Wedderburn—You mentioned the lapwing just now among the birds which have increased in your part of the world (Lincolnshire)?—Yes; it has increased greatly. I attribute the increase of the lapwing to the more general cultivation of turnips and green crops; they feed on the *Agrotis segetum* and other grubs that are found in turnip-fields. Is it not the case with the lapwing that while the bird itself is unmolested, its eggs are taken in very large numbers?—Yes; the lapwing's eggs are taken very largely; but much larger numbers are destroyed by the various operations of agriculture, harrowing, rolling and so on; yet in spite of all this the lapwing has very greatly increased. Does not that bear out the theory that improved conditions of existence are far more important than any protection for increasing the numbers of birds—Yes, I think so to a considerable extent." Lord Lilford, on the other hand, in his evidence before the same committee says his own experience is that the peewit is less common in Northamptonshire than it used to be. He further states that he thinks there is a large importation of plovers' eggs into this country from Holland. Probably quite as many are imported as are taken in this country. In those parts of England where this bird is on the increase, it is no doubt due, as Mr. Cordeaux states, to the more general cultivation o suitable crops; and where it is on the decrease, it is owing to the absence of these conditions and the improved drainage of the land. As regards the eggs of the sparrow-hawk, moor-hen and coot being often sold for plovers' eggs, why should not those of the common fowl be also included? They are more easily obtained and have quite as much claim to resemblance as those above named! Only last year I saw the eggs of the black-headed gull, which had been picked out of a consignment of plovers' eggs and laid aside in a poulterer's shop in London. These, however, though more closely resembling the eggs of the plover, are easily detected from their greater size, shape and colouring—*A. P. L.*

The Black Scoter (*Oidemia nigra*) breeding in Britain.—In reply to Mr. Southwell's request (Science-Gossip No. 325, p. 21) for further particulars respecting this interesting ornithological fact, at my request Mr. Fowler has been good enough to furnish me with the following additional details. "At last (Feb. 24th) I find time to answer your enquiries *re* Black Scoter nesting on the Earnley Marshes. The brood this year was seven, and I purposely shot the old drake for specimen for my cases. I am sorry now that I did not get any of the young. I could easily have done so. When I saw the young birds first they could just fly, but only a short way. I saw the two old birds off and on all the summer, without thinking of the probability of their nesting, or caring much about it. In August I flushed the family, and killed the old male. If they had been mallards I could have killed most of them with two barrels of my 12-bore. I have made enquiries since first writing to you, and find that the Black Scoter nests here every year; and if this be so, I will try and find the nest this coming season, when

you will hear from me again." Mr. Southwell's communication with regard to the broods of young birds seen on the Hickling Broads is of much interest, and, as he says, this evidence lends support to Mr. Fowler's discovery.—*Joseph Anderson, Jun., Chichester.*

MICROSCOPY.

Scum at the Pilot Station, Saugor.—On the 8th January last, a bucket of sea-water was sent to me, in order that I might examine "some curious things contained in it." Saugor is at the mouth of the Hooghly, the river on which this city stands; and it is about eighty miles from here. The "curious things" were hollow, spherical organisms, of a greenish and greenish-yellow colour, eminently

Fig. 50.

Fig. 49.

Chlorophyll bodies from the membrane of the "scum" globules. A, Seibert's $\frac{1}{16}$ in. w. i.; B, Student's $\frac{1}{4}$.

suggestive of grapes in general appearance. They were filled with sea-water. Lifted out of the water, they collapsed like bubbles, leaving only a thin, greenish film on the hand, or glass. I placed one in a beaker with sea-water, and gently let fresh water into the vessel from a tap, until the whole of the salt water was displaced. This caused the sphere to grow flaccid; but in the course of about thirty-six hours it resumed its normal form, though it was now paler in colour, and eventually became a dirty white. The globules varied from about three-quarters of an inch to half that size in diameter. From information obtained by me from persons who observed the scum, I gather that the stuff floated from six to nine inches below the surface, that it extended over several miles of surface, and was of some depth; it was so dense in parts that the water seemed nearly black; when first gathered it had a fine bright, but rather light-brownish or yellowish colour; the shades of colour in the scum as it floated in the water varied; the darker-coloured specimens were at the surface, sinking when they got lighter-coloured; that the natives and fishermen in the creeks of the adjacent (Soonderbun) country, say the scum breeds in the grass and jungle which grow in the water on the banks of the creeks, and thence floats away with the tide, though the person who told me this added that he doubted if it was so, because the gelatinous-looking scum was far more abundant in the open water of the sea and river between the Sandheads (Saugor) and Diamond Harbour than it was anywhere in or near the creeks; and that it has been noticed in small patches in previous seasons, but never in such enormous quantities as it was this year. The scum has always been regarded as a fish-spawn; it was supposed to be that of the cat-fish. The batch sent to me, including the specimen removed as above-described to fresh water, remained intact for about three weeks; on the morning of the 28th January all the glassy spheres had collapsed, and only a thin, dirty-green scum lay at the bottom of the vessels in which I had placed the stuff. Examined under the microscope, I found numerous chlorophyll bodies embedded in a delicate, hyaline, gelatinous membrane (matrix), which forms the sphere, and which is all that remains when the globules are removed from the water, and collapse. An idea of the general appearance of these chlorophyll bodies may be obtained by reference to Pl. 5, fig. 5 (*Apiocystis Brauniana*) in the "Micrographic Dictionary." These bodies readily take a deep stain if roseine is used, while the membrane is but slightly tinted; I cannot say that anything is gained by staining them. They are about $\frac{1}{5000}$ of an inch in length, and $\frac{1}{11000}$ in breadth. It seems to me that the organism is allied to the Nostocs, and that it is probably only an intermediate life-stage in the development of some other form. The question remains—what is it? Several to whom the matter has been referred here have been unable to throw any light on the subject, though they are agreed as to the vegetable character of the gelatinous-looking spheres. Will any of your numerous and widely-scattered readers tell us something about the scum over which we have been puzzling our heads?—*W. J. Simmons, Calcutta.*

The Royal Microscopical Society.—The last Journal of the above society contains the following papers, in addition to the summary of current researches relating to zoology and botany:—"Further Notes on the Monochromatic Illuminating Apparatus," by E. M. Nelson; and "Freshwater Algæ and Schizophyceæ of South-West Surrey," by A. W. Bennett.

The Quekett Club.—The last number of the "Quekett Journal" contains the following papers:—"On Notops Minor," by C. Rousselet; "On a New Cysticercus and a New Tape-Worm," by F. B. Rossiter; "On Two New Rotifers," and "On the Sense of Vision in Rotifers," by C. Rousselet; "On Two Undescribed Male Rotifers," by G. Western; "Further Note on the Sense of Vision in Rotifers," by C. Rousselet; "On Two Rotifers from Epping Forest," by F. A. Parsons; "On the Diffraction Theory of Microscopic Vision," by E. M. Nelson; "On Mounting Media of High Refractive Indices," by J. E. Ingpen.

BOTANY.

Botanical Monstrosities, 1891.—*Primula vulgaris*—coloured variety, five blossoms, which consisted of one whorl of green leaves, with aborted organs in the interior after the fashion of an ovary; they evidently came from more than one peduncle, as they occurred on both sides of the plant. One of the coloured flowers on the same plant had but four corolla divisions. Another specimen of the yellow type had a leaf-like calyx enclosing a very diminutive corolla; while some gigantic blossoms were also seen, whose calyx and corolla had six and eight divisions, one possessing two pistils. *Anemone nemorosa*—with pink flowers. *Plantago lanceolata*—a lot of spikes having many heads, some with small leaves intermixed between the sessile heads; one also had a double fasciated stem. *Scilla nutans*—white specimens. *Ajuga reptans*—white specimens. *Chrysanthemum leucanthemum*—several having yellow disc flowers only, with no rays. *Garden geranium*—in which the peduncle was suppressed, leaving a cluster of flowers in the axil of a leaf. *Trifolium pratense*—two-headed. *Scabiosa arvensis*—several flowers with leaf-like involucre. *Potentilla reptans*—with four instead of five petals. *Sisymbrium officinale*—stem aborted, so that instead of the inflorescence being elongated with blossoms extending all the way up, they were all produced in a bunch. *Plantago major*—a number of spikes having several leaves at base of each. *Bartsia odontites*—fasciated stems after the fashion of a cockscomb. *Centaurea nigra*—fasciated two-headed stem. *Achillea ptarmica*—being a mass of flocky material somewhat like a miniature cauliflower, possibly caused by insects; about a dozen specimens. The above list comprises the abnormal forms found in the above season, which were new to me; others were also seen for the third or fourth time, which have been recorded in earlier years.—*Edwin E. Turner, Coggleshall, Essex.*

Diseases of the Primrose Family.—Two years ago I examined the flowers of the primrose (*Primula vulgaris*) and cowslip (*Primula veris*), and found in my investigations that the former is more subject to disease than the latter. Last year I was not able to, but hope to resume my examinations this year; and I should like the readers of Science-Gossip to aid me in doing so, and to help me to answer the questions at the end of this letter. The following are some of my notes on the subject that I took:—(i.) that out of thirty-two (taking this as an average) specimens of *Primula vulgaris*, two-thirds of them were diseased. (ii.) As regards same number of *Primula veris*, only one-third of them were diseased. (iii.) That the thrum-eyed *Primula vulgaris* was more liable to disease than the pin-eyed. (iv.) That in both cases, if one flower on a plant was diseased, all were. (v.) The disease was in the tube of the corolla and seemed to be of a fungous nature, but I did not take particular note of it at the time. My specimens were all, with one exception, found in hedges, copses, and woods of Shropshire and Cheshire; the exception was got in a garden, but in all cases I found the same result. All specimens seemed from external appearances more or less perfect and healthy, in size varying from ½ to 1½ inches in diameter. I shall be glad and beg your readers to furnish me with any notes on this during the spring and summer, and I give my address below. The questions are:—I. Are *Primula vulgaris* flowers more liable to disease than those of *Primula veris*, and in what ratio? II. Is the Thrum-eyed *Primula vulgaris* more so than the Pin-eyed?—*J. H. Barbour*, 1 *Hamilton Villas, Ballyholme, Bangor, Co. Down, Ireland.*

GEOLOGY.

Notes on Trees.—We are very glad to steal the following notes from a short paper, communicated by W. Whitaker, B.A., F.R.S., to the Hampshire Literary and Philosophical Society:—The labour of a field-geologist leads him much into out-of-the-way places that are rarely seen by others than those who are employed in them; so that he has chances of seeing notable things outside his own special line of work. Moreover, in the detailed mapping of the various formations, he has often to depend on indirect evidence, the direct evidence of sections being absent. Besides the character of the soil, the form of the ground and the outbreak of springs, he may note the general character of the vegetation, though perhaps having but the smallest amount of botanical knowledge. These notes, therefore, must be taken as those of a geologist, not of a botanist, and consequently as in great part from a geologic point of view, referring somewhat to the connection between soil and growth. They are written in the hope that they may be of interest to that large class, lovers of trees, and that they may lead to other records of a like kind. (1). *Beeches on London Clay.*—On the higher parts of the escarpment of the London clay northward of Southampton and in some other places, there are very fine beeches, often in groups, as may be well seen in the eastern and western parts of Ampfield Wood, where one spot indeed is named The Beeches. These sites are at or near the junction of the London clay with the overlying Bagshot sand, or rather one should say about the passage of those beds into one another, and in other cases the beeches are also on the uppermost loamy part of the former formation. Now beeches, it is well known, grow best on a calcareous soil, oaks and elms being more proper to clays and loams; and so, seeing so many fine beeches at this particular geologic horizon, one is led to think that the beds on

which they grow must be more calcareous than the rest of the London clay: the beeches having, as it were, made a rough analysis of the soil and found therein a proper amount of calcic carbonate, have elected to settle. We know that there is always a certain amount of calcic carbonate in the London clay, though not enough to tempt beeches to grow, but it is usually collected together for the most part into nodular masses of earthy limestone, known as septaria. Perhaps in the beds in question this segregation of calcic carbonate has not taken place, the material being more diffused through the loam, and so being more available for beech-use. A little south of Ampfield Wood, by the high road through South Holmes Copse, some two miles as the crow flies (but rather more as the Field Club goes) from Romsey Station, is another group of fine beeches, in this case near the base of the clayey Bracklesham Beds. (2.) *Varying Fall of Leaf in Oaks.*—Down the south-easterly slope on the road just eastward of Woodley (E. of Romsey) are some rather fine oaks. Having occasion to pass by these a few times in the autumn of 1889, I was struck by the difference in the relative state of some of them. Three of the finest trees were selected for observation, all being of much the same size. One of these is close to the top of the slope and on the northern side of the road; the second is just eastward and slightly lower; whilst the third is to the S.E., on the other side of the road, and still lower. On October 31st, the first had its foliage green, in general effect at all events; the leaves of the second had turned yellow; the third was bare of leaves. On November 11th, the leaves of the first were turning yellow. This difference in the state of the foliage was very striking, and there seemed to be nothing in the trees themselves to account for it; all were strong and healthy. All too are on the same geologic formation, clayey Bracklesham Beds; but it occurred to me that the first being a little below the edge of the gravel that caps the hill, may perhaps be more plentifully watered, and so may have the power of holding its leaves longer. This, however, does not seem to account for the difference between the second and third, and one is led to think that the difference of level, though not great, is the cause (or the chief cause) of the difference in the state of the trees; those in the lower, more sheltered sites being more affected by the frost or chill of night, which acts more strongly where the leaves are more covered with moisture than when they are cleared by evaporation in a more open spot. It is to be hoped that some local observer will watch these trees and see if the above-noted appearance is recurrent. (3.) *Double Trees.*—Something having been said of beech and of oak separately, attention is now drawn to a strange combination of the two, of which beech-oaks, however, I have seen only two examples. The first seen is on the high ground in the eastern part of Cranbury Park, at the edge of the wood that clothes the escarpment of the London clay above Otterbourne, and near the junction of that formation with the Bagshot Pebble Beds. The other is but a little way in Ampfield Wood, by the side of the road to Hursley Park, a little northward of Knap Hill; it is on Bagshot sand, near the outcrop of the London clay, and is a remarkably fine tree, which ought to be seen by the Hampshire Field Club and photographed. The peculiarity of these trees is that they consist of a beech and of an oak, the stems of which grow up together closely, so as practically to form one tree. In both cases beech and oak are equally fine, and in the second each would separately form a notable tree. The effect in each case is strange (when the trees are in leaf), and at first perhaps unexpected. One might think that the branches of oak and of beech would intermix, but they do not in the least; or that beech would grow on one side and oak on the other, but neither is this the case. Then perhaps the national weakness of an Englishman for the oak would lead him to expect that tree to conquer and to suppress the beech. Not so has it happened, however: the oak is nowhere in the contest, the beech takes the whole space at first, so that an observer underneath the tree and standing on the side of the beech-stem, would have no suspicion of the existence of the oak, not a leaf, not a branch of which is to be seen; but let him walk away from the tree and he will see that, when the beech has grown upward and outward to its full content, then the oak branches out above and has the top part to itself, so that no one seeing the top alone would expect to find a beech-tree underneath. Probably the fact is that the beech is the strongest of trees, as surely it is the most beautiful.

THE CORRECT IDENTIFICATION OF DEEP SEA SOUNDINGS.—In the ordinary way it would appear that a rough description of the nature of a bottom from the specimen brought up in the sounding-tube or snapper, would be an easy matter. But this I have found to be extremely erroneous in the hands of the majority of observers. To take for instance such simple cases as one constantly sees marked on the charts where the bottom is recorded as *crl.* (coral); the uninitiated would at once associate this sounding with the cœlenteratæ, and would, in the majority of cases, be wrong; for the *crl.* noted is more frequently either fragments of calcareous seaweeds or of polyzoa, which in places cover the bottom of the sea over large areas and to great depths. Another case is that caused by constantly mistaking the larger foraminiferæ for sand-grains, the rubbing of a small piece of the sounding between the fingers making it appear sandy, though an ordinary pocket lens would at once show the difference. Cases such as the above might be multiplied considerably. It is almost unnecessary

to point out what a loss it is to oceanography that such descriptions should be erroneously made, and in the majority of cases there would be no difficulty in giving a more correct description. It may be said that the soundings can always be overhauled afterwards and the results given to the world; but this is only done in isolated cases, and the results are not very accessible. Again the descriptions recorded in the charts are generally taken from those noted when the sounding is taken, when observations as to colour, scent, and stratification should also be noted. I would like to suggest that soundings taken with the ordinary tube sounders, should be preserved in glass tubes closed at both ends by corks. The soundings being forced directly from the sounding-tubes into the glass tubes; their preservation is then much more perfect than in the ordinary way. A label affixed to the tube gives locality of sounding, notes as to colour, scent, stratification, and surface of sounding, etc. The figure illustrates this.—*D. Wilson Barker*, 66 *Gloucester Crescent, N.W.*

Fig. 51.—A, B, C, D, glass tube (can easily be cut to any length with a file); K K, corks closing ends; S, S′, S″, S″, sounding from tube.

THE following papers were read at a recent meeting of the Geological Society. "The Raised Beaches, and 'Head,' or Rubble-Drift, of the South of England: their Relation to the Valley-Drifts and to the Glacial Period; and on a late Post-Glacial Submergence.—Part II." by Joseph Prestwich, D.C.L., F.R.S., F.G.S. The ossiferous deposits of the Caves of Gower are shown to be contemporaneous with the raised sand-dunes between the beaches and the "head," and reasons are given for supposing that the elevation of land which preceded their formation need not necessarily have been greater than 120 feet. The mammalian fauna of these caves is the last fauna of the glacial or post-glacial period, and the head, or "rubble-drift," marks the closing chapter of glacial times. Evidence is given for considering that the "rubble-drift" has a wide inland range, and that to it are to be referred the "head" of De la Beche, the subaerial detritus of Godwin-Austen, the angular flint drift of Murchison, and in part the "trail" of Fisher and the "warp" of Trimmer, as well as other deposits described by the author. The accumulation is widespread over the South of England, and occurs in the Thames Valley, on the Cotteswold Hills, and on the flanks of the Malverns. The stream-tin detritus of Cornwall, and the ossiferous breccia filling fissures (which must be distinguished from the ossiferous deposits of the true caves) are held to be representatives of the "rubble-drift," which is of a variable character. The author discusses the views of previous writers on the origin of the accumulations, which he classes together as "rubble-drift," and points out objections to the various views. He considers that they were formed on upheaval after a period of submergence which took place slowly and tolerably uniformly; and that the absence of marine remains and sedimentation shows the submergence to have been short. This submergence cannot have been less than 1000 feet below present sea-level, and was shortly brought to a termination by a series of intermittent uplifts, of which the "head" affords a measure, sufficiently rapid to produce currents radiating from the higher parts of the country, causing the spread of the surface-detritus from various local centres of higher ground. The remains of the land animals killed during the submergence were swept with this débris into the hollows and fissures on the surface, and finally over the old cliffs to the sea and valley levels. Simultaneously with this elevation occurred a marked change of climate, and the temperature approached that of the present day. The formation of the 'head' was followed in immediate succession by the accumulation of recent alluvial deposits; so that the glacial times came, geologically speaking, to within a measurable distance of our own times, the transition being short and almost abrupt In this paper only the area in which the evidence is most complete is described. The author has, however, corroborative evidence of submergence on the other side of the Channel. "The Pleistocene Deposits of the Sussex Coast, and their Equivalents in other Districts." By Clement Reid, Esq., F.L.S., F.G.S. The gales of last autumn and early winter exposed sections such as had not before been visible in the Selsey Peninsula. Numerous large erratic blocks were discovered, sunk in pits in the Bracklesham Beds. These erratics included characteristic rocks from the Isle of Wight. The gravel with erratics is older, not newer, as is commonly stated, than the Selsey "mud-deposit" with southern mollusca. Numerous re-deposited erratics are found in the mud-deposit, which is divisible into two stages, a lower, purely marine, and an upper, or Scrobicularia mud, with acorns and estuarine shells. At West Wittering a fluviatile deposit, with erratics at its base and stony loam above, is apparently closely allied to the mud-

deposit of Selsey; it yields numerous plants, land and freshwater mollusca, and mammalian bones, of which lists are given. The strata between the brick-earth (=Coombe Rock) and the gravel with large erratics yield southern plants and animals, and seem to have been laid down during a mild or interglacial episode. A similar succession is found in the Thames Valley, and in various parts of our eastern counties.

THE GEOLOGISTS' ASSOCIATION.—We have to acknowledge the February issue of the "Proceedings of the Geologists' Association," containing reports of ordinary meetings, and the following papers:—"Organic Matter as a Geological Agent," by the Rev. A. Irving; "Supplementary Observations on some Fossil Fishes of the English Lower Oolites," by A. Smith Woodward; "The Geology of the Country round Stirling," by H. W. Monckton, with Appendix by J. G. Goodchild; "The Geology of Devizes, with Remarks on the Grouping of Cretaceous Deposits," by A. J. Jukes-Browne (to be continued).

NOTES AND QUERIES.

THE WHITE FLOWER QUESTION.—The questions raised at page 263, November number, by Mr. John Corrie may be tentatively and provisionally answered as follows:—(1.) Is it the case that when flowers change from one colour to another it is in an unchanging order from yellow to white, from white to red, and finally to blue?—reversions, of course, in inverse order. The view that all flowers were originally yellow, etc., is a merely gratuitous hypothesis specially designed to bolster up the utterly false assumption that flowers have been rendered conspicuous and beautiful in order to attract insects, a doctrine which has proved to be one of the most mischievous of the Darwinian chimeras. Yellow flowers are the least liable, even less liable than orange flowers, to change into white; and the purest blue flowers are those which are most frequently found colourless or nearly so. (2.) If this is so, why is it that blue flowers revert directly to white instead of to red, the colour from which they have more recently been evolved? The researches of scientists have shown that in most cases, the blue and the red colouring-matter is due to one and the same substance. The normal colour is, I believe, red, and the blue colour (only about sixty species in our flora are of this colour) may at any time "sport" into red, as it entirely depends upon the coexistence in the petals of other substances which precipitate or neutralise the aids or oxidising agencies which help to produce or deepen the red tint. Some gardeners can artificially change the red to blue by using artificial solutions for watering, etc.; but this can only be done in the case of flowers whose tints are slight, and where the pigment is normally produced in comparatively small amounts, otherwise the artificial strain would almost certainly be green, or yellow, *i.e.* in this case a very light tint of red brown. Hence, also, it would follow that the purer the colour, the more liable it is to vanish and fade into pure white. (3.) Is it the case that lessened vegetative vigour tends to check the development of colour, and if so, to what extent does the check operate? Unquestionably this is so; but we must endeavour to get at the life of the process a little nearer than what is implied when it is said that "colours are a result of nutrition." Personally I am fully satisfied that the colours of petals are the result of certain changes which the tannins and glucosides originally evolved in the leaves, buds, roots, seeds, etc., undergo, and the structure of the petals is just the very thing most eminently calculated, if not to help in evolving the tints, at least, to show them off to the best advantage. Hence it follows inevitably, that whatever tends to check the production of tannin and glucoside will also indirectly lessen the formation of pigment. These bodies are the result of the processes of metabolism which are constantly carried on more quickly or more slowly according to the general vegetative vigour of the particular plant. It would be needless to enter into detail; but there is one agent that can be fastened on with great confidence, and perhaps, therefore, may be mentioned here. The size and brilliant colouration of the Arctic and Alpine flora have been frequently admired, and the latter feature has been attributed to two causes, viz., an increase of chlorophyllous tissue, or their comparative leaf-surface, and the vast quantity of light which is shed on these plants during their short period of growth. Now these two factors are precisely the same as what other independent investigators have found to be principally concerned in the increased production of the special cell-contents (tannin and glucoside) which, as it were, metabolise into the bright pigments.—*P. Q. Keegan.*

BIRDS AND FRUIT.—A very heavy crop of damsons was grown in this district last summer, with the result that a large proportion of the fruit was left on the trees, as it was found that it only paid to pick the best of them. In the autumn the plantations were visited by immense flocks of fieldfares and redwings, which appear to have migrated to Kent for the sole purpose of feeding on the damsons. Besides these two species there was a considerable number of blackbirds and thrushes. Only once before have I heard any noise to compare with the "chatter" emitted by these birds—this was at the roosting-place of one of those immense flocks of starlings that are seen in the autumn. On being disturbed, the fieldfares would rise, uttering their peculiar "chuck-chuck-chuck," and fly some distance, only to return again in a few minutes, while the redwings, blackbirds, and thrushes, being less shy, would merely fly to a short distance from the intruder. Day after day thousands of these birds were to be seen, until they had eaten up all the pulp of the fruit, leaving the ground strewn with the bare stones. And now (January) an altogether different noise may be heard. Large flocks of hawfinches have arrived to complete the work commenced by the soft-billed thrushes. If one walks quietly through the plantations, he will hear a distinct cracking noise, caused by the hawfinches splitting the damson stones with their powerful beaks, in order to get at the kernel: already a considerable proportion of the stones have been thus cracked. I believe this bird is a good deal commoner than is generally supposed. On account of its shyness, it is not often seen, but its "robin-like" note may frequently be heard as it flies over at a great height. Bullfinches, too, come to the plantations in large numbers at this time of the year, to feed on the blossom-buds of various fruit-trees. I have frequently induced these birds to come quite near, and occasionally have had the pleasure of hearing their beautiful natural song, which is so low, that it can only be heard at a very short distance.—*Edward Goodwin, Wateringbury, Kent.*

A Marsh Garden.—In your May 1891 Number (No 317) you have an article entitled "A Marsh Garden." As I am desirous of trying this, could any reader kindly tell me where I could get a piece of marsh as therein described, either to purchase or exchange?—*C. Pemberton.*

Flints in Chalk, &c.—As county Antrim is probably the best county in Great Britain to study such objects, many articles have been written on them. The county is full of flints; they are very plentiful in our "Cretaceous Limestone," which is exposed on fine cliffs along a coast-line of about seventy or eighty miles, and in sections everywhere through the county. During the British Association's visit to Belfast in 1874, a Society to which I belong (the Belfast Naturalists' Field Club), and which has always taken the greatest possible interest in the Cretaceous Limestones of Antrim, and the banded flints, sponge spicules and Foraminifera which are so common in hollow flints in some districts, published a complete Nat. Hist. Guide of some hundred pages, for the use of members of the B.A. This is still the standard guide, although only a very few copies are now to be had from the Secs. of the club (Museum, Belfast), and contains all information about the chalk flints of Antrim. It was on the Cave Hill Limestone Quarries at Belfast that the late Dean Buckland saw those long-shaped peculiar flints, with hollow tube running through them, that he called "Paramoudras" and got so much laughed at for so calling, on the word of a quarryman. I have many geological photos of county Antrim Basaltic rocks and Cretaceous. The views I have of the Cave Hill Quarries show the flints in regular stratified layers or bands. If, however, any reader would like to have a list of the best papers written on the subject, address Mr. S. A. Stewart, F.L.S., Museum, Belfast; he will doubtless give a list. The B.N.F.C. Guide, I may say, is now reduced to 2*s.* each. It was the first thing of its kind so elaborately done for a B.A. visit to any city, and has formed the standard for every guide published since 1874 for the B.A. visits to other towns. Wm. Gray, Esq., C.E., M.R.I.A., one of its principal compilers (along with Mr. Stewart), could give any special information on Antrim flints that may be wanted. He contributed a very scholarly paper on "Rudely-worked Flints of County Antrim," giving the cliff sections from which the flint material came, to the Journal of the Royal Hist. and Archæolog. Society of Ireland (now the Royal Soc. of Antiquaries, Ireland). I have just hunted through the back vols. in my Antiq. bookcase, and I find that it is contained in vol. 5, 4th Series, in 1879–82. Mr. Gray's address is Mount Charles, Belfast, and he probably could send a "reprint," as the society furnishes all readers of papers with, I think, fifty reprints. Mr. Thos. Plunkett, F.G.S., M.R.I.A., of Enniskillen, could give you any information about the bands of cherty flints that occur in the great inland limestone cliffs (Carboniferous) of Knockmore, county Fermanagh, if he has none of the reprints from his papers contributed to the Royal Irish Academy, of which he is a member.—*R. Welch.*

"What Offers?"—Will you allow me to suggest that those correspondents who make use of the "Exchange" column, in Science-Gossip, should give some indication of the kind of exchange they desire. "What offers?" is very indefinite, but "What offers in"—say—"birds' eggs?" "shells?" or "insects?" or "cash?" would afford information which would very often save other people's time and trouble. I have found recently that these indefinite gentlemen want to sell—usually at good prices—and it seems to me that such offers ought not to be classed under the heading of "Exchanges," as they are misleading. I would suggest that you should start a separate column for the benefit of those who wish to effect exchanges for coin of the realm. Whether you should make a charge, or not, to those who use it, is your affair and no concern of mine, but the present system of lumping the two classes together is inconvenient and misleading. I do not wish my name to appear in connection with this suggestion, as I have no doubt the people to whom I refer would resent it.

Extinction of the Lapwing.—I note in the February number a paragraph speaking of the probable extinction of the lapwing, owing to the rapacity of egg collectors and dealers, and in the same number I noticed no fewer than five advertisements (including exchanges) of these gentry. These are the pests who are rapidly bringing about the extermination of all our rare birds, and preventing the breeding here of any occasional visitors from other regions. It is absurd to dignify such an occupation by the name of science; it is mere sordid greed, which all good naturalists should discourage to the utmost, and it would be a good deed if Science-Gossip and all other respectable publications were to refuse such advertisements.—*W. Ward.*

NOTICES TO CORRESPONDENTS.

To Correspondents and Exchangers.—As we now publish Science-Gossip earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

To Anonymous Querists.—We must adhere to our rule of not noticing queries which do not bear the writers' names.

To Dealers and Others.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply Disguised Advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges," which cannot be tolerated.

We request that all exchanges may be signed with name (or initials) and full address at the end.

Special Note.—There is a tendency on the part of some exchangers to send more than one per month. We only allow this in the case of writers of papers.

To our Recent Exchangers.—We are willing to be helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

R. B. Postans.—Will you kindly send us your address, so that proofs of your articles may be sent you?

A. Launder.—"Flowers: their Origin, Perfume, Shape, Colours," can be obtained of Messrs. W. H. Allen & Co. Masters' work on Teratology is now getting scarce; it was published by the Ray Society. You had best apply to Messrs. Wesley & Son, Essex Street, Strand, for a secondhand copy, or to Messrs. Dulau, 37 Soho Square.

W. Palmer.—Get Bennett's work (fully illustrated), published by Longmans at, we believe, 4*s.* 6*d.* Other good books are Prantl and Vine's "Botany" (Macmillan), and Hooker's "Botany" (same publisher).

A correspondent from the Isle of Wight, whose note we have mislaid, sends us a box containing teeth and bony scales, under the impression that both are fossils. This is not the case. The teeth are recent, but the bony scales are plates of siluroid fishes from the Eocene strata.

F. J. Bing.—The snake-like fossil in flint is undoubtedly a Serpula. They are not unfrequent. We have seen them coiled like a basket of snakes on the surface of flints, and penetrating their interior. The Norwich chalk and chalk flints are famous for them.

A. J. ADAMS.—Obtain Dulau's Catalogue of Works, &c., on Geology, just published, 37 Soho Square, London, W.

H. E. GRISET.—Get Bausch's "Manipulation of the Microscope" from W. P. Collins, 157 Great Portland Street, London, W.

J. K.—The lichens are correctly named.

C. L. R.—You had best advertise in SCIENCE-GOSSIP.

A. J. SHAW.—We were at a loss for some time to identify the "green bags," found on the sea-shore. We have tracked them down. They are the outer skins of green melons which have been in sea-water some time, so that all the interior pulp has been dissolved out, and only the external hardy pericarp left as an empty "green bag." The microscope shows the characteristic hairs.

W. WILSON.—The "Science Made Easy" was published by D. Bogue. You can get copies, we believe, of Messrs. W. H. Allen & Co., Waterloo Place.

EXCHANGES.

WILL send collections of two hundred named specimens (sixty species) Victoria shells, in return for same number named recent shells of any other country.—F. L. Billinghurst, National Bank of Australasia, Castlemaine, Victoria, Australia.

WILL give two beautiful micro. slides for each of the following eggs: kestrel, sparrow-hawk, kite, marsh harrier, redwing, fieldfair, ring-ousel, cirl-bunting, brambling, hawfinch, g. woodpecker, nuthatch, golden plover, heron, curlew, ruff, corn-snipe, dunlin, water-rail, puffin, g. crested grebe.—Batty, Corby, Grantham.

WANTED, *Less. Jaossi* and *bisuffarcinata*, *Wald. humeralis*, and *Rhyn. Sutherlandi*, also any Brachiopoda from the Northampton, Lincolnshire, or Yorkshire oolites. Offered in exchange, good specimens of *Jur. brachiopoda* from the W. and S.W. of England.—J. W. D. Marshall, 16 Peter Street, Bristol.

OFFERED, eggs of cuckoo, nuthatch, nightingale, marsh-tit, cole-tit, great tit, stonechat, whinchat, red-backed shrike, bullfinch, yellow wagtail, nightjar, &c., all in clutches. Wanted, clutches of many other species. Please send lists to—W. Wells Bladen, Stone, Staffs.

OFFERED, 270 species and varieties of British mosses, named and localised. Wanted, natural history books, especially on freshwater algæ, or apparatus.—R. V. Tellam, Bodmin.

WANTED, to correspond with entomologists in the United States, Australia, &c., with a view to exchanging aculeate Hymenoptera.—G. E. Frisby, 27 Hedley Street, Maidstone, Kent.

WANTED, back parts of "Journal of Postal Microscopical Society," also back vols. of SCIENCE-GOSSIP, and any works treating on the microscope.—L. Francis, 38 Aldred Road, Kennington Park, London, S.E.

WANTED, micro. turntable and dissecting case, and other micro. sundries.—L. Francis, 38 Aldred Road, Kennington Park, London, S.E.

WANTED, cuckoos' eggs, with clutches of the following species: garden warbler, redstart, reed warbler, common wren, red-backed shrike, nightingale, chiffchaff, woodlark, common bunting, house sparrow. Good eggs offered in exchange.—W. Wells Bladen, Stone, Staffs.

SLIDE of flea of mole, in exchange for other slide of interest; coal sections preferred.—J. Boggus, Alton, Hants.

OFFERED, *Tapes decussatus.* Wanted, *Pecten striatus*, *Mytilus ungulata*, *Nucula sulcata*, *Arca obliqua*, *A. pectunculoides*, *Cardium aculeatum*, *C. papillosum*, *Astarte sulcata*, *Venus casina*, *V. striatula*, *Tellina balaustrina*, *Psammobia costulata*, *P. vespertina*, *Donax politus*, *Lutraria oblonga*, *Mya Binghami*, *Panopea plicata*, *Saxicana arebica*, *Trochus amabilis*, *Duminyi occidentalis*, *Littorina sinistrorsa*, *Scalaria Trevelyana*, *Iantina communis*, *Natica Islandica*, *Nassa nitida*, *Tapes aureus*, *Triton nodifer*, *cutaceus*, *Ovula patula*, *Accra bullata*, *Bulla hydatis*, *utriculus*, *Aplysia punctata*, *Spiralis retroversus*, *Clio pyramidala*, *Melampus myosotis*, *Assiminia littorina.*—J. Smith, Monkredding, Kilwinning.

A LARGE assortment of dredgings from known localities, containing rare forms, to exchange for similar material from stations not already possessed. Correspondence invited prior to exchanges being forwarded.—W. H. Harris, 42 St. Brannock's Road, Ilfracombe.

WANTED, minerals, fossils, or rocks in exchange for novels (Scott, Kingsley, &c.) and a large reptile cage with glass sides, hot-water draw, and wood top with glass windows.—A. C. Binns, 114 Bramhall Lane, Stockport.

AN album containing over 400 arms, crests, and monograms, with space for 360 more, in good condition. Will exchange for any description of entomological apparatus.

WANTED, foraminiferous material and insects from all parts of the world. Will give good exchange in micro. slides or unmounted objects.—George T. Reed, 87 Lordship Road, Stoke Newington, London, N.

SCIENCE-GOSSIP for 1883 bound, 1884–86 unbound, plates complete, clean; "Science for All," 5 vols. bound, first edition. Wanted, 4-inch condensers, and offers. Address—B. H., 113 Grange Road, E. Middlesbrough.

OFFERED, Mackay's "Flora Hibernica" (contains full descriptions of cryptogams by Taylor), also some loose plates with illustrations of mosses. Wanted, Backhouse's "Hieracia," and back numbers of "Journal of Botany."—Rev. C. H. Waddell, Saintfield, Co. Down.

WANTED, diatom earth from Atlantic City, N.J. Will give other deposits.—W. Ward, 31 Hill Lane, Southampton.

WANTED, Cornish or other minerals in exchange for Weardale spars and minerals.—T. V. Devey, Wolsingham, Darlington.

WANTED, to exchange carboniferous fossils for fossils from other formations.—D. Firth, Dukinfield.

EOCENE fossils, named and localised, also minerals and Cornish rocks. Will exchange for other minerals and rock specimens, terebratulæ from chalk (perfect), or offers.—E. H. V. Davies, 46 Upper Belgrave Road, Clifton, Bristol.

WANTED, a microscope and good botanical slides, in return for British and foreign shells, and rare polished geological corals and sponges, or state wants. Good exchange sent.—A. J. R. Sclater, M.C.S., Natural History Stores, 43 Northumberland Place, Teignmouth.

I CAN offer rare microscopic objects and material, fossils, minerals, shells (of which I have a large number), in exchange for a quantity of foreign stamps, watch that will keep time, telescope, field-glass, or anything scientific.—T. E. Sclater, Northumberland House, The Strand, Teignmouth.

SCOTCH examples of the following shells in exchange for others not in collection, eggs or insects: *Helix arbustorum*, *erectorum* var. *lutescens*, *H. nemoralis* var. *libellula*, *rubella*, *bimarginata*, *H. hortensis*, *S. corneum* var. *pisidoides*, *Hydr. ulvæ*, *V. piscinalis*, *S. elegans*, *V. pellucida*, *Zon. nitidulus*, *M. incurva*, *pellucida*, *T. fabula*, *T. phasiolina*, *testudinalis*, *F. antiquus*, *V. gallina*, *D. politis*, *M. solida*, *stultorum*, &c.—W. Turnbull, 1 Horne Terrace, Edinburgh.

BRITISH and exotic lepidoptera in exchange for pupæ and good microscopic slides.—Joseph Anderson, jun., Alre Villa, Chichester, Sussex.

WANTED, "Photo-Micrography," by A. Pringle, F.R.M.S. Will give in exchange "Botanical Micro. Chemistry," by Poulsen and Trelease, "Postal Micro. Society's Journal," vol. iii., "Science Monthly," vol. i., and good microscopic slides.—P. Kilgour, 164 Lochee Road, Dundee, N.B.

OFFERED, Cassell's "Electricity in the Service of Man," half roan, new; also lady's silver watch. Wanted, works on literature, especially Craik's "Manual of Engl. Lit." (1883); Morley's "First Sketch of Engl. Lit." (18—?), and "Engl. Lit. of Victoria" (1882); Richardson's "Primer of Amer. Lit." (1878); Saintsbury's "Primer of French Lit." (1880); Hallam's "Lit. of Europe" (1882), &c.—Chas. Leigh, 47 Sydney Street, London, S.W.

WANTED, *Pis. nitidum*, *Pis. roseum*, *L. involuta*, *Test. haliotidea*, *Succ. oblonga*, *H. obvoluta*, several species of vertigo, *Acme lineata.* Offered, many species and varieties of British land and freshwater shells.—H. E. Craven, Matlock Bridge.

WANTED, Cooke's "British Hepaticæ," or "Science Gossip Guide to Hepaticæ."—J. H. Salter, University College, Aberystwyth.

STUDENT'S microscope for sale—Newton, Fleet Street—lenses, object slides, new.—C., 15 Aliwal Road, Clapham Junction, S.W.

BOOKS, ETC., RECEIVED FOR NOTICE.

"Bulletin of the United States' Geological Survey, Nos. 62, 65, 67–81 (Washington: Government Printing Office).—"The Medical Annual," 1892 (Bristol: Wright).—"Modern Science," edited by Sir John Lubbock, Bart.—"The Horse," by William Henry Flower," C.B. (London: Kegan Paul, Trench, Trübner & Co., Ltd.).—"Transactions of the Yorkshire Naturalists' Union," parts 10–16.—"Fifth Report of the United States' Entomological Commission on Insects injurious to Forest and Shade Trees," by A. S. Packard, M.D. (Washington: Government Printing Office).—"Annual Report of the Smithsonian Institution," vols. 1887–89 (Washington: Government Printing Office).—"Gentleman's Magazine."—"The Idler."—"The Mediterranean Naturalist."—"The Midland Naturalist."—"The Garner."—"The Naturalist."—"Journal of the Royal Microscopical Society."—"Natural Science."—"Collectors' Monthly."—"Catalogue of the Land and Freshwater Shells hitherto recorded as found in the County of Suffolk," by Carleton Greene, M.A.—"American Microscopist," &c., &c.

COMMUNICATIONS RECEIVED UP TO THE 12TH ULT. FROM: W. W. B.—J. W. D. M.—G. C.—A. E. H.—R. V. T.—S. B. C.—J. A.—W. T. S.—J. C. W.—W. W.—G. R. T.—G. T. R.—C. H. W.—B. H.—W. I. H.—W. P.—T. V. D.—D. F.—E. H. O. D.—A. L.—W. T.—E. E. T.—J. E. S.—A. J. R. S.—J. H. S.—A. P. L.—H. E. C.—C. L.—J. A.—P. K.—F. G. B.—H. F.—C.—W. J. S.—F. G. B.—L. F.—W. W. B.—J. H. B.—D. W.—D. W. B.—A. H. W.—H. D.—A. C. B.—J. S.—J. B.—W. D. R.—G. E. F.—E. E. G.—F. A. F.—W. S. P.—M. D.—M. L.—W. H. H.—J. E. T.—A. A. C.—W. W.—T. G. B.—&c., &c.

SOME FAMOUS COLLECTING-GROUNDS FOR DRAGON-FLIES.

By the Author of "An Illustrated Handbook of British Dragon-flies," "A Label List of British Dragon-flies," etc., etc.

III.—THE FEN DISTRICT.

THIS area, which comprises the marshy districts of Norfolk, Suffolk, Cambridge, Huntingdon, and Lincolnshire, is, next to the New Forest, probably the best hunting-ground for dragon-flies in the British Isles.

Although of late years large tracts of marshland in each of the above counties have been drained, there still remain thousands and thousands of acres which will probably take centuries to reclaim. This is particularly the case in Norfolk, where, owing to tidal influences, many of the fens are incapable of being converted into cornfields, as they have been done so extensively in the adjoining county of Cambridge.

Dragon-fly hunting in the fens possesses many charms for those who delight to revel in the midst of nature. The most enjoyable way of spending a holiday in this manner, would be to hire a yacht—one built on the "wherry" plan, which is a very comfortable craft and easily managed, would be found the most suitable. A few days and nights spent on the water in this way by a small party, would not fail to prove a very pleasant occupation in the summer time.

The rivers and broads of Norfolk and Suffolk afford an inexhaustible field for operations by the dragon-fly collector, as do also the extensive undrained fens of Cambridge, particularly Whittlesea Mere, Burwash Fen and Wicken Fen.

In the county of Norfolk the vicinity of Great Yarmouth will be found a very good one for these grand insects, as also will the neighbourhood of Norwich, which is a very good centre of operations for Wroxham Broad, Horning, and Fritton Decoy, all of which are well-known happy hunting-grounds for these "winged gems."

The following is a list of the species of dragon-flies which have been known to occur in the Fen District of the East of England: *Platetrum depressum* (common). *Libellula fulva* (Burwash Fen and Whittlesea Mere in Cambridgeshire, and Sprowston, in the neighbourhood of Norwich; in the latter locality it is abundant in certain seasons). The variety *fugax* (also has been taken in Whittlesea Mere). *Leptetrum quadrimaculata* (common). The variety *prænubila* (has been taken in Burwash Fen). *Orthetrum cærulescens* (not uncommon). *O. cancellatum* (Whittlesea Mere, also Horning and Fakenham in Norfolk, but very local). *Leucorrhinia dubia* (Glandford Brigg in Lincolnshire, very local). *Sympetrum vulgatum* (abundant everywhere). *S. flaveolum* (Whittlesea Mere, where it may always be met with during favourable seasons). *S. sanguineum* (local). *S. scoticum* (doubtful). *Cordulia ænea* (Wisbeach, also Starston and Costessy Woods in Norfolk, but very local). *Gomphus vulgatissimus* (rare). *Cordulegaster annulatus* (scarce). *Anax formosus* (doubtful). *Brachytron pratense* (very local). *Æschna juncea* (very local; I have had a specimen sent me from the Devil's Dyke, in Cambridgeshire). *Æ. cyanea* (very common). *Æ. grandis* (common). *Æ. rufescens* (the

idea is prevalent that this species is becoming extinct; it used to be taken at Yarmouth, Halvergate, and Whittlesea Mere). *Calopteryx virgo* (abundant everywhere). *C. splendens* (ditto). *Lestes nympha* (has been taken in Suffolk, and elsewhere in the Fen District, but very local). *L. sponsa* (not uncommon). *Platycnemis pennipes* (not uncommon, but local). *Enallagma cyathigerum* (common). *Agrion pulchellum* (ditto). *A. puella* (exceedingly abundant). *Ischnura pumilio* (rare and local). *I. elegans* (very plentiful). *Pyrrhosoma minium* (exceedingly plentiful). *P. tenellum* (doubtful). *Erythromma najas* (has been taken in Lincolnshire, but very rare and local; it used also to be found formerly in Cambridgeshire).

The foregoing localities are taken from my "Illustrated Handbook of British Dragon-flies," * to which little work I beg to refer the reader in quest of information concerning the time of appearance and habits, etc., of the species enumerated in the above list.

THE CONSTANCY OF THE BEE.

By G. W. Bulman, M.A., B.Sc.

THE theory that bees confine themselves to one particular species of flower, during at least a single journey, seems to be one of those which manage to survive to old age on a minimum of observed facts. Copied from one book to another, it has become an integral part of the received ideas about bees: it forms part of the stock in trade of everyone who aspires to write about them. Not to go back too far, the following statement is found in a work on insects, published in 1829, ("The Natural History of Insects," London, Murray):

"Now, it has been remarked by a great number of naturalists, that the bee, when it collects pollen from one plant, does not go to a different sort of plant for more, but labouring to collect the same kind of fertilizing dust, it seeks only the same kinds of flowers. . . . . 'I have frequently,' says Dobs, 'followed a bee loading the farina-beebread or crude wax on its legs, through part of a great field in flower, and on whatever flower it first alighted and gathered the farina, it continued gathering from that kind of flower, and passed over many other species, though very numerous in the field, without alighting on or loading from them, though the flower it chose was much scarcer than the others: so that if it began to load from a daisy, it continued loading from the same, neglecting clover, honey-suckle, and the violet.'"

The same idea is expressed in one of the most recent and authoritative works on bees:

"The curious habit of the Apidæ of visiting one kind of flower only during any single excursion." ("Bees and Bee-Keeping," Frank Cheshire.)

* It is published by Mr. E. W. Allen, 4 Ave Maria Lane, London, E.C., price 2*s.* 6*d.*

Grant Allen, too, makes use of the same theoretical constancy of the bee in the development of his various honey-bearing plants. Thus, speaking of ants, he says, "They do not go, like flying insects, straight from one plant to another of the same species, but being guided by scent alone, climb up different stems indiscriminately, wherever the smell of honey lures them on."

And this, he continues, is the reason why ants "do not aid cross-fertilisation, but rather prevent it."

Sir John Lubbock's statement is more guarded and nearer the truth:

"They fly readily from one plant to another, and generally confine themselves for a certain time to the same species." ("Ants, Bees, and Wasps," p. 50.)

It is certainly a fact that bees very often make a large number of visits to a single species of flowers; it is probable that they often confine themselves to one for a whole journey. Presumably, then, a limited and casual observation of the habits of bees, such as one who considers the question authoritatively settled naturally gives, simply confirms the received opinion; any divergence is looked upon as a chance exception. More extended and careful observation, however, shows that these exceptions are too numerous to permit the existence of a rigid rule. Such, at least, is my experience. When I first observed a few instances of bees changing from one species to another, I looked upon them rather as chance exceptions to a general rule, than as facts of any importance.

More careful watching, however, has revealed the fact that the exceptions are really very numerous. During the year 1888, I scarcely ever watched the bees for more than a few minutes without seeing some examples of changeableness. The fact that the watching not infrequently ended in the disappearance of the bee when a few visits had been noted, suggests that these examples may really be more numerous than the recorded cases imply.

Thus during an afternoon walk a bee is noted busy on a flower of water-avens (*Geum rivale*). It visits other two of the same, and then two or three blossoms of herb Robert (*Geranium Robertianum*). Further on three bees are busy on some vetch in the corner of a field. One of them, a very large humble-bee, after paying a good number of visits to the vetch flowers, flies off and alights on a head of scabious. After working this, it passes on to yellow charlock among the corn. And this is no exceptional occurrence, but one which may frequently be observed. I will now give a few examples, premising that they are not the results of prolonged periods of watching, but of short intervals of from ten to thirty minutes. On one occasion I observed the following changes: Bee No. 1 was busy on the blue flowers of *Veronica Buxbaumii*, from which it passed to chickweed. Bee No. 2 passed from little celandine to scilla, and thence to celandine again. Bee No. 3 passed from

Veronica Buxbaumii to chickweed, and then back to *Veronica*. Bee No. 4 passed from celandine to scilla. On another occasion: Bee No. 1 visits flowers in the following order: hyacinth, *Veronica Buxbaumii*, sweet violet, hyacinth, *Veronica Buxbaumii*. Bee No. 2 goes from red dead-nettle to hyacinth. The bee which has obtained the highest place on my record behaved as follows:

Geranium	Robertianum	2 visits
,,	nemorum	3 ,,
,,	Robert.	3 ,,
,,	lucidum	1 visit
,,	Robert.	1 ,,
,,	lucidum	1 ,,
,,	Robert.	6 visits
,,	sanguineum	1 visit
,,	Robert	4 visits
,,	nemorum	2 ,,
,,	Robert.	3 ,,

That is to say, 10 changes for 27 visits.

On one occasion I watched some bees visiting campanulas growing near a bush of syringa. During a few minutes' observation, six bees passed from the blue flowers of the former to the white flowers of the latter. Presumably many of them also returned to the blue, but I only watched their movements in the one direction.

These facts are not brought forward simply to correct an error which in itself seems of little importance: they have an important bearing on the bee-selection theory. It may be said, indeed, that the erroneous conception of the bee's strict constancy forms one of the pillars upon which the superstructure of that theory rests. Now it seems quite evident that the facts here brought forward are sufficient to deal a death-blow to the above theory of the bee's selective action. If the bee of to-day passes freely, in many cases, from one species to another, then, surely, *à fortiori*, would the bee of bygone ages pass freely from variety to variety: the result of its visits would be to obliterate the incipient species by crossing it with the parent stock and with other varieties.

The necessity of this assumed constancy of the bee, as a factor in the evolution of the flower by its selection, is admitted by Mr. Grant Allen in the words already quoted. If bees fly from flower to flower of different species, they too will "not aid cross-fertilisation, but rather prevent it." When, however, the species are incipient, that is to say mere varieties, the result of the bees' action will be to blend them together.

We are sorry to see that Professor Williamson, F.R.S., has retired from the Chair of Botany, at Owens College, Manchester, after more than half a century's long, faithful, and enthusiastic services. Professor Williamson was a born teacher, capable of enlisting hosts of recruits in botany, both recent and fossil.

NOTES ON THE INFUSORIA.

By Bernard Thomas.

III.

7. *Chætoglena volvocinea* (Fig. 53 *f, g*) is somewhat larger than the preceding, as it is a little less than the thousandth of an inch in its longest diameter. It is about twice as long as broad. From the anterior part of the cell-wall there is a projecting rim surrounding the hole through which, as in Doxococcus, the flagellum protrudes. The cell-wall is dark olive-green in colour and the contained protoplasm resembles the previously described species. There seem to be two varieties, both similar in shape, but in one the cell-wall is rough externally, in the other smooth.

The forms Euglena, Phacus, Doxococcus, and Chætoglena belong most probably to the Algæ, and are hence plants. Several of their near allies, furnished with flagella, live in colonies, among which we might mention Valvox, Gonium, Pandorina, and several others. It is not here intended to enter into a description of these forms, as they, even more evidently, belong to the plant circle. Indeed the preceding are only here introduced to contrast them with the Flagellate Infusoria. We may briefly group these relations as follows:—

A. *Principal resemblances to the Infusoria* (*Flagellata*).—Presence of flagellum in all species. Unicellularity. Contractile nature of ectosarc in some species (e.g. *Euglena viridis*). Eye-spot present in some Infusorians (Dinobryon).

B. *Principal differences from the Flagellata.*—Presence of green chlorophyll. Presence of eye-spot. Absence of food-vacuoles, and perhaps of contractile vesicles. Nature and manner of life.

8. *Cercomonas acuminata* (Fig. 54 *a*) is usually found in large numbers in putrifying pond-water. It is exceedingly small, so small, indeed, that it requires a high power with good definition to make out anything of its structure. In its interior a few granules can generally be distinguished. From two opposite ends there arises a delicate process, one of these is a flagellum but the other is described as a delicate protoplasmic thread or tail, incapable of vibration.

This little organism is a representative of the Monads, whose life-history has been so well worked out by Drs. Dallinger and Drysdale; and it was then shown that these Monads reproduced not only by fission but also sexually, by conjugation.

The term Monad was at one time applied to all the Flagellata.

9. *Anisonema* (Fig. 54 *b*), which seems to be identical with *Bodo grandis*, is an infusorian of considerable size, larger even than Astasia. Besides the

flagellum it has a long trailing filament which can be retracted into its interior. By this organ, and by its slow gliding movement, it can be readily recognised. Granules can be seen in its clear protoplasm as well as a contractile space, placed posteriorly, and the Diatoms it has swallowed as food.

Codosiga and Dinobryon; in the former, Uvella and Anthophysa.

10. *Uvella* (Fig. 54 *c*, *d*, *e*) is free swimming. I have found quantities of it in water where flowers had been left standing a long time. In all probability the spores were on the flower-stalks and had developed

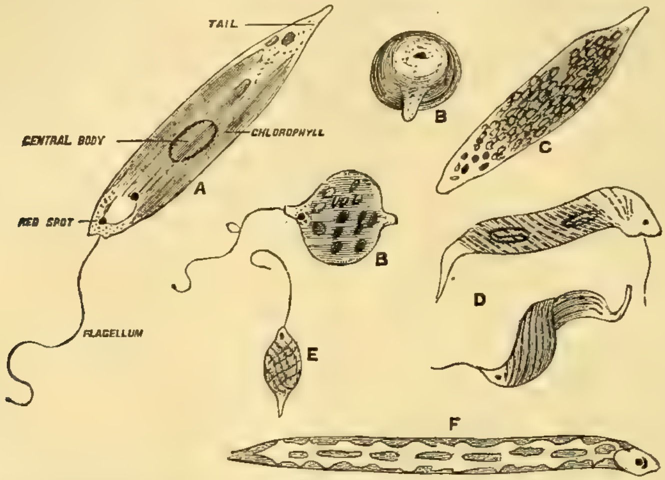

Fig. 52.—A, *Euglena viridis* extended, showing flagellum, red spot, chlorophyll, central body; B, *Euglena viridis* contracted; C, *Euglena viridis* filled with granules; D, *Euglena longicauda*; E, *Euglena pyrum*; F, Euglena-like organism.

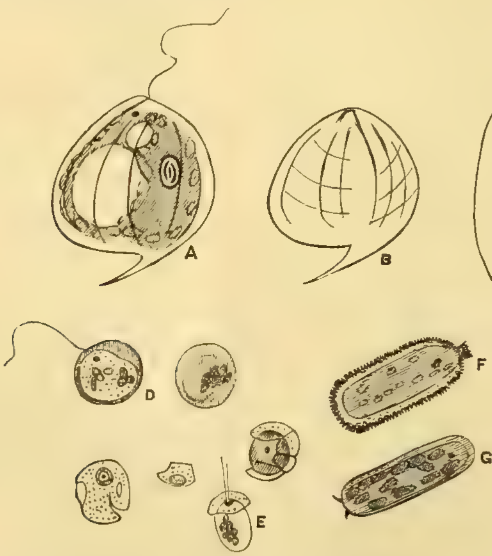

Fig. 53.—*Phacus pleuronotes*, front view; B, *Phacus pleuronotes*, empty case; C, *Phacus pleuronotes*, side view; D, *Doxococcus ruber*; E, *Doxococcus*, crushed; F, *Chætoglena volvocinea* with spines; G, *Chætoglena* without spines. In neither of these is the flagellum represented. (See last Number.)

We now pass to those members of this family which are found in groups or colonies, and although these are clustered together they have no organic connection.

Among these there may be mentioned those whose protoplasm is naked, and those which are furnished with a case or cell-wall. In the latter we have in the water. Little transparent masses, resembling bunches of grapes, were seen actively moving among Bacteria and Amœbæ, with which the water was crowded. Each mass is composed of little oval infusorians or zoöids, sometimes of only a few, often of very many.

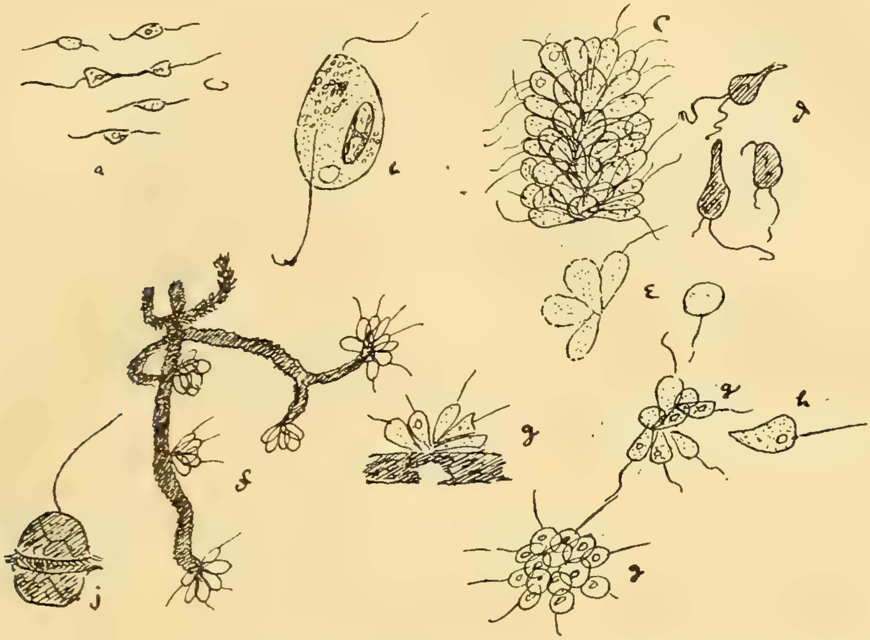

Fig. 54.—*a*, *Cercomonas acuminata*; *b*, *Anisonema sulcata*; *c*, Uvella group; *d*, ditto, stained with iodine; *e*, ditto, higher power; *f*, *Anthophysa Mülleri*; *g*, ditto, higher power; *h*, ditto, single zoöid; *j*, *Peridinium cinctum*, low power.

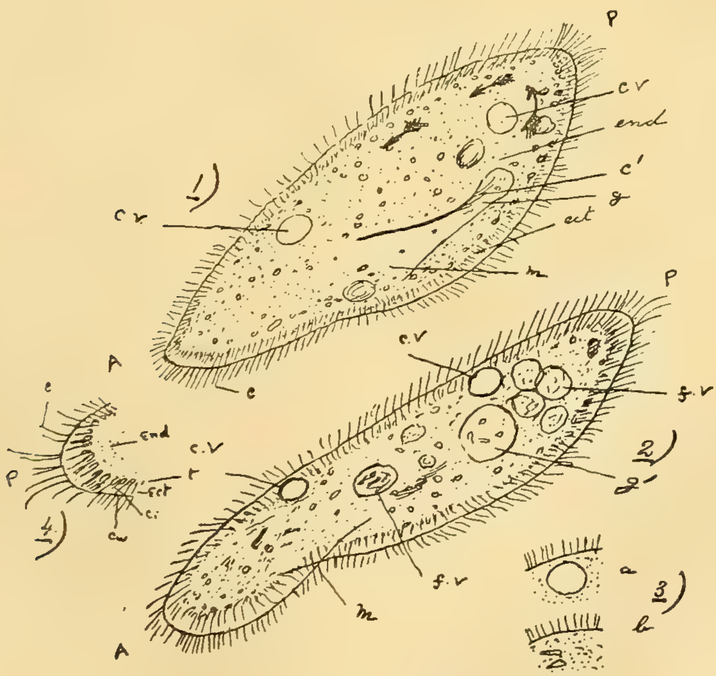

Fig. 55.—*Paramecium aurelia.* 1, front view; 2, side view; 3, contractile space; *a*, diastole; *b*, systole, showing two canals; 4, posterior end, showing posterior cilia; *ect*, ectosarc; *cu*, external layer; *ci*, ciliary layer; *t*, deepest layer; *ci* and *t* make up the cortical layer. In all the figures: *c*, cilia; *c'*, cilia of gullet; *ect*, ectosarc; *end*, endosarc; *c.v*, contractile spaces; *f.v*, food vacuole; *m*, mouth; *g*, œsophagus or gullet; *g'*, dilation of gullet; A, anterior, and P, posterior end. The arrows in 1 represent the direction of the current.

Each zoöid is pear-shaped, with a slightly pointed tail. The anterior part, the broader, is slightly indented, and from this the flagella spring. Usually there is one large granule in the interior. Stained with iodine, these organisms are seen to have two flagella, often of unequal length. The vibrations of these organs produce in the colony a rotatory movement. The zoöids may be often found free.

11. *Anthophysa Mülleri* (Fig. 54 *f, g, h*). The zoöids of Anthophysa resemble those of Uvella, but have only one flagellum. They are formed on a branching stalk of a brownish hue, and occasionally they get free from this and are then seen swimming freely about. The stalks are sometimes so numerous that they give a brown colour to pond-water.

12. *Bodo socialis* is also another small sociable infusorian found in pond-water.

With regard to the two forms Codosiga and Dinobryon, I have never properly examined them, and so will omit them here.

13. *Noctiluca miliaris* is the largest of the Flagellata. It is the common cause of the beautiful phosphorescence of our sea in summer-time. The organism is easily visible to the naked eye. It is somewhat kidney-shaped, one end is cleft, and from the top of this there issues a large thick flagellum, striated transversely. At the base of this is a tooth, and below the tooth a delicate tiny flagellum. The network of protoplasm is very distinct, and the nucleus may be seen, together with large food-vacuoles or "stomachs," which often contain large diatoms.

CILIO FLAGELLATA.

Of this division of the Infusoria, which may be supposed to be a transition-stage between the Flagellata and the Ciliata, only one representative is here briefly introduced.

14. *Peridinium cinctum* (Fig. 54 *j*) is a member of this family. It is divided by a constriction into two halves, each furnished with a case or *lorica*, which, like the silicious covering of the diatom, is beautifully sculptured. From the constriction appear the cilia, and from the apex the flagellum. This organism is green in colour, and resembles to a certain degree the larval form of some of the worm family.

Glenodinium and *Ceratium* also belong to the Cilio-flagellata. The former is brown in colour and inhabits fresh water, and the latter is phosporescent and marine

The higher members of the Infusoria now occupy our attention. This forms the third family, and is known as the Ciliata.

CILIATA.

The large size of these organisms and their common occurrence render them admirably suited for microscopic study. They exist in great diversity of form, and they may be classified, as will be shown later, according to the arrangement of the cilia.

Instead of noting their general characters, however, it will suffice to first describe a typical species. Accordingly we will begin with *Paramecium aurelia*, merely mentioning that it is one of the holotrichous Ciliata.

15. *Paramecium aurelia* (Fig. 55)—the slipper-animalcule—is a large free-swimming species; its length is about the hundredth of an inch. It is found in pond-water, and though by no means uncommon, the other Ciliata must not be mistaken for it. It is oval in shape, slightly narrower in profile than front view. At the anterior end it is folded near the mouth, and this gives it its slipper-like shape.

The cilia are strong and arise from depressions in the ectosarc, which is fairly thick and tough. The roots of these cilia can be seen for some distance piercing its outer layer, and this gives it a striated appearance. When in motion they move so rapidly that they cannot be seen, their rate is slackened or accelerated, and often some are moving while others are at rest.

At this point it may not be out of place to define briefly what a cilium is. It is a lash-like organ, a fine filament, difficult often to see both from its motility, and also from the slight density of its substance, which seems little greater than that of water. If we watch a row of cilia in action we see a wave produced. This is because the cilia do not move quite at the same time, but follow each other after an imperceptible interval. The action of a cilium is like that of a lash which moves sharply downwards and then returns more slowly back to an upright position. Hence, by their united action, a current is produced which may be used either for locomotion—as in the cilia which cover the surface—or to produce a current for food—as in those which line the œsophagus.

The most superficial layer of the ectosarc is the firmest and in some Ciliata becomes a hardened cuticle or exudation layer (Fig. 55). Beneath this the remainder of the ectosarc is called the cortex and divided into three layers. First the layer which gives rise to the cilia known as the ciliary layer, next the muscular or myophan layer, lastly, the deepest layer, which in some Infusoria contains thread-cells similar to, but much smaller than the thread-cells (trichocysts) of the Hydra. The ectosarc, then, is by no means so simple as in Amœba, but it must be understood that these layers are not clearly defined one from another. The inner protoplasm or endosarc is more fluid and exhibits a rotation or streaming of the particles which it contains. This is best studied in *Paramecium bursaria*.

There are two contractile spaces situated one near each end, probably in the deepest layers of the ectosarc. At first one is inclined to confuse these with the numerous food-vacuoles present in various parts of the endosarc, but by carefully watching, the spaces are seen to disappear and then slowly reappear. The disappearance of the vesicle is called its systole,

and its reappearance its diastole. The contraction and expansion are rhythmical, occurring at regular intervals, like the systole and diastole of the heart. I have noted the phenomenon, and seen that, when the space disappears, two small triangular canals are seen (Fig. 55), then gradually the vesicle reappears, growing larger and larger, and the canals vanish. When the space has reached its full size, it remains for a short time and then suddenly vanishes. The sequence of events, as well as the rhythm, remind one forcibly of the cardiac cycle. In a Vorticella the time occupied from systole to systole was about half a minute.*

There are usually numerous food-vacuoles in the endorsarc, sometimes filled with fluid, sometimes with solid particles. Somewhere near the centre of the cell is a round endoplast with a smaller endoplastule attached to it.

The mouth commences in a fold or involution which passes into a short ciliated gullet or œsophagus (Fig. 55*g*). This last ends blindly in a round sac which, in some views, may easily be mistaken for a large food-cavity. The food enters this sac, drawn in by the action of the cilia, which seem to be constantly working. Carmine particles introduced into the water will be drawn into the body in the same way, so that Paramecium does not select its food, but takes whatever may come within the current. However, it makes longer delays where there is most food. The food or particles of matter having entered the dilatation of the gullet become drawn with surrounding water into the semi-fluid protoplasm, where a food-vacuole is formed. At one time the Infusoria were called Polygastria, because it was supposed that the vacuoles were connected by a delicate canal, and each space formed a stomach. The vacuoles have no such connection with each other, although they may lie very closely together. When the film of endosarc separating them becomes too thin, it gives way, and they fuse into one large vacuole. The nutritive material having been extracted from the food, it is expelled at a definite region near the mouth (anal area), but there seems to be no permanent orifice.

We thus see that Paramecium is a very complicated cell and very different from the Amœba or the cells that form our own tissues. Indeed, in the Ciliata the cell attains morphologically its highest place, and cell differentiation (a process in which the various parts are differently developed for different purposes) is nowhere seen to greater perfection.

It is not intended to occupy much space in considering the reproduction of Paramecium, but it is interesting to know that it either reproduces itself asexually by simple division of its substance into two, or sexually by the more uncommon process of conjugation observed and described by Balbiani.

(*To be continued.*)

* Thirty-two seconds.

TWO BOG FLOWERS.

IN the boggy ground that is so frequent upon our mountain sides, there is one little plant that cannot fail to attract the notice of those who wander thither. Its rosette of shining yellowish leaves is closely pressed down upon the mosses amongst which it chooses its home, in company with the sundew, bog pimpernel, asphodel, and such-like moisture-loving plants. If it be the early summer-time, one or more flowers somewhat resembling the violet in form and colour will be seen, each rising on a long elegant scape from the centre of the rosette o leaves. This is the butterwort (*Pinguicula vulgaris*), and it is to the peculiar greasy appearance of the leaves that it owes its generic name (pinguis = fat); of the common English name, something will be said further on. The plants that compose the order to which it belongs (Lentibularineæ) are, for the most part, dwellers in marshes or water, but the only other genus of this order in our country is the bladderwort (*Utricularia*), so named from the little bladder-like pitchers that buoy it up in the water, and possibly serve other purposes not yet satisfactorily defined. The Lentibularineæ have strong affinities with the Scrophularineæ, and these are specially shown in the personate or two-lipped corolla, and the spur of the lower lip as well as in the axile placentation of the ovary, but it has also peculiarities of structure that will appear as we proceed.

We will first examine the leaves, which are oblong and obtuse, with a broad, short, sheathing petiole. The margins are strongly curved inwards, especially towards the tip, and make the leaf into a sort of little spoon, a form which is said to have its use in detaining small insects, for the consumption of this so-called carnivorous plant ! If a lens be used to inspect the texture of the leaf more closely, we find that it is thickly dotted over with minute oil-glands, which impart the greasiness that is as perceptible to the touch as to the sight. The flower-scape rises erect from the centre of the plant to the height of several inches, and like the leaves is thickly studded with glandular hairs. The calyx is small; and the five sepals, three in front and two rather longer behind, give it somewhat the appearance of a claw holding the corolla in place. The flower is not unlike a violet at first sight, but the two-lipped corolla is gamopetalous, and a little careful manipulation will bring it off in one piece, when the short tube by which it is attached below the ovary (hypogynous) is to be seen, like a hole cut in the upper lip at the back of the lobes. The lower lip is broad and three-lobed, and the throat is densely covered with a perfect forest of jointed white hairs turning inwards. Looking full into the face of this pretty flower, one can at first see neither stamens nor pistil, so cunningly are they concealed; but just underneath the upper lip there is something that looks like a fold or scale, and by tearing down the

lower lip the funniest little apparatus comes into view, and we find that this fold is the leaf-like expansion of the stigma. The two stamens are placed in front of the ovary, as shown in the drawing, the anthers being tucked under the curling leaf of the stigma, the upper part of which has a sort of upright tail, which is its second lobe. If a somewhat older flower be examined, the stamens will be found in exactly the same position, but the anthers having burst transversely, the pollen will be seen exuding from beneath the enfolding lobe of the stigma, ready to be transferred to the sticky portion of the same stigma, or a different one should some insect visitor arrive betimes. On removing the stamens with a needle, the ovary is seen, dotted over, like the rest of the plant, with

Fig. 56.—Butterwort (*Pinguicula vulgaris*).

shining glands on its pale green surface, and a very pretty object it is with the delicate purple stigma curling over its summit and the little tail cocked up pertly behind. So much for the structure of the flower; and now a few words as to the measures adopted by the plant for ensuring the efficacy of those possible or probable insect visits just alluded to.

There is a tribe of hard dry-leaved plants called Bromeliaceæ, natives of the continent and islands of America, and capable of enduring great drought without inconvenience, of which the pine-apple is a familiar example. Professor Kerner says that the structure of the butterworts reminds him of this tribe, in which a rosette of leaves forms a basin, and out of its middle rises a slender flower-stem. The basin gets filled with rain or dew, and the flower-stalk being thus isolated, creeping insects are prevented from climbing up the stem and getting at the honey which the plant reserves for those only that are useful to it. In the butterwort, this rosette-like basin (or what answers the same purpose) is covered with a tenacious, viscid slime, which is secreted by the thickly crowded glandular hairs. This secretion is so tenacious that no small insect can get free from it, and the writer has often counted ten or a dozen lying dead upon a single leaf, some of their bodies being transparent, as if the juices had been sucked out. The larger insects can, of course, free themselves, but they always make for the outer edge of the leaf, and avoid climbing up the flower-stalk. It is generally allowed that the butterworts are able to subsist without absorbing the juices of insects after the manner of the sundews, but we may well believe that the sticky rosette of leaves and the glandular scape effectually prevent small insects from creeping up after the honey, while the broad lower lip of the corolla affords a

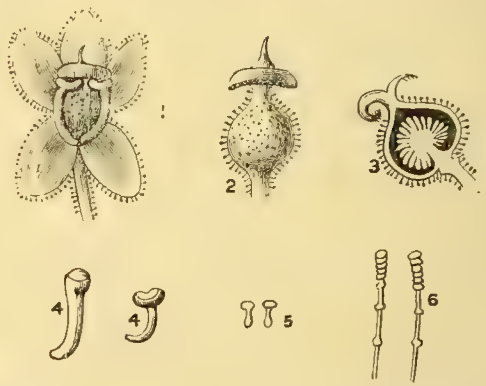

Fig. 57.—1, Calyx, with stamens seen in front of ovary, leaf-like stigma overarching them; 2, pistil; 3, longitudinal section of same; 4, 4, stamens in different states; 5, glandular hairs of leaves; 6, club-shaped jointed hairs of corolla. All much magnified.

convenient landing-place for those welcome guests who come to it on the wing, and do not try to enter by the back door!

In early June the writer had the pleasure of finding the pale butterwort (*Pinguicula lusitanica*) in the New Forest. It is a plant that is confined to our extreme southern and south-western counties, having a range from Hants to Cornwall, where it seems to occupy the position of its sister-plant in the more northerly parts of the kingdom, *P. vulgaris* being rare in the south. The pale butterwort is an altogether smaller and more dainty little plant than the latter; its rosette of leaves is yellower, and its pale lilac flowers are variously streaked and stained with deep purple and orange markings. The corolla has not the peculiar flattened appearance of the common butterwort, nor is the spur so pointed. The roots, as is commonly the case among bog-plants, are small, and are chiefly useful for anchorage, as the leaves, being so closely

pressed down on to the damp moss, must absorb at least as much moisture through their delicate surfaces as the roots take up; they are remarkably thin in texture, with rolled-in edges and a net-work of ramifying purple veins, but they are not as greasy-looking as in *P. vulgaris.* It may also be remarked that no dead flies were found upon them. On the freshly

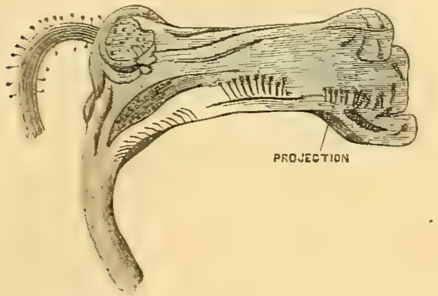

Fig. 58.—Section of flower of *Pinguicula lusitanica* (enlarged projection).

Fig. 59.—*Pinguicula lusitanica.*

Fig. 60. Fig. 61. Fig. 62.

Fig. 60.—Jointed white hairs on lobes of corolla.
Fig. 61.—Projection of mouth of *Pinguicula lusitanica.*
Fig. 62.—Projection and hollows (highly magnified).

gathered specimens there were numbers of tiny beetles that seemed to walk about with great ease; perhaps their hard covering and little wiry legs enabled them to set at defiance the cloggy stickiness that might have been fatal to more delicately-formed insects; sometimes, however, the horny beetle-cases were transparent and empty, but since the plants have been living in captivity the old leaves have died and with them their little denizens have departed, so that special observations have not been made on this point. The flower of *P. lusitanica* has not the personate appearance of *P. vulgaris,* the corolla is rather inflated than compressed, and the spur instead of being acute, is obtuse and almost inclined to be lobed at its saccate base. The enlarged section of the flower shows a projection that rises near the entrance, covered with a short velvety pile of fine clubbed hairs. It is tucked up from the outside, like the lip of a snapdragon, and a ridge beyond it continues still further into the throat, crested with orange-tipped hairs. There is a hollow on each side of the ridge perfectly free from hairs, and their opposite sides are bounded by two more ridges, with hairs reaching still further into the throat. The position of the stamens and pistil is similar to that which obtains in *P. vulgaris;* and the arrangement of hairs within the corolla suggests that they are intended to act as guides to those insects who may visit the flower in search of the honey contained in the spur, for no insect of the proper size could possibly reach it without at the same time touching both stamens and pistil in succession. In default of this agency, the flower can doubtless fertilize itself; for the pollen oozes out plentifully from under the pistil-lobe, and might easily overflow on to its upper stigmatic surface; indeed this must be the case, for the plants that for the last six weeks have been living in a make-believe bog in a soup-plate, have blossomed and set their seed, and are now scattering it from their ripe capsules, as if they were quite at home, and are only a trifle paler than they were in the bog at Lyndhurst. The flowers lasted a long time without withering, and as this is usually a question of fertilization, the little butterworts probably waited as long as possible for the insects who never visited them in their captivity, and at last were obliged to dispense with their services. It is pleasant to see the capsules split and scatter the pretty seeds upon the moss. The leaves of *P. vulgaris* have the remarkable property of giving consistence to milk, and preventing it turning into whey or cream. The product is a sort of solid sour milk, not at all unpleasant to the taste, especially in hot weather. It is much used in Norway and Sweden.

M. D. D.

Hawkshead, Ambleside.

A REMINISCENCE OF MALTA.

IT was about six o'clock in the morning when the S.S. *Orontes* dropped anchor in the Grand Harbour at Malta; and shortly afterwards we received the welcome intelligence that pratique had been given, and that we were at liberty to go on shore to amuse ourselves, as best we could, in the *Fior del Mondo* for the space of twenty-four hours.

Here was an opportunity that was not to be missed. I had long ago done the usual round of the "lions" of Valetta, and therefore neither Strada Reale, the Palace, nor the Armoury had any further charms for me. My desire now was to visit Citta Vecchia, the old capital of the islands, the crumbling walls and deserted palaces of which are situated on the summit of one of the spurs of the Binjemma Hills, at a distance of about seven miles from the present capital.

After the usual amount of bargaining with several Maltese cabmen, whose custom, by the bye, is always to ask the tourist three times what is legally due to them, and double what they expect to receive, I hired a carrozza, and was soon rolling along at a brisk pace through the noisy, dusty streets of Floriana and Hamrun.

None of the resources of modern science or of modern architecture appear to have been called into requisition in the planning of these ill-built and badly-drained suburbs, and it was, therefore, with a feeling of relief that I left them behind, and turned to welcome the sight of the picturesque little villages of Lia and Attard, that shortly afterwards loomed in sight. Had time permitted, I should have paid a visit to the palace, with its lovely gardens and spacious orange-groves, which is situated on the outskirts of Lia, and to which the Governor and his family usually go in the summer months, to escape the suffocating heat of the town. But my anxiety to reach my destination, and to spend as long a time as possible among the ruins of the old city on the hill, induced me to put off my visit to St. Antonio's Palace until some more fitting occasion.

After leaving the village, a bend in the road brought us within full view of the old capital. It crowns the summit of a small tableland, the top of which is about 600 feet above the sea-level. The original portion of the city seems to have been built on the north and north-western edge of the plateau; but of late years considerable additions have been made, and the town and its suburbs now cover a much larger area. The cathedral, a lofty and imposing structure, is built on the edge of the cliffs; and from the bottom of the hill it forms the most striking feature of the place. The hospital, too, that stands by the side of it, and which formerly served as an auberge for the Knights of Malta, is scarcely less remarkable; while the number of elegant buildings that are ranged around are so grouped as, in the distance, to form a scene, the general effect of which is very impressive.

The position and physical surroundings of a place play a part in the enhancement of its beauty such as no number of superb buildings can supply. In Citta Vecchia this is particularly exemplified. Owing to its unique position, the old town is capable of making a picture from any point of view whatever. It certainly looked very beautiful in the grey morning light, when I saw it from the foot of the hill near St. Salvatore; but it is from the Musta Road that it must be viewed to catch it in its most charming aspect. There the contrasts in art and nature are alike more detailed, more striking; there the scene that is presented is more comprehensive, more picturesque.

Nor is the charm dispelled on a closer acquaintance. As the old walls are approached, the city, as a whole, fades from the mind; and the particular then takes the place of the general. The ramparts, the bastions, the fosse, each in turn engage the attention; and thus what is lost in picturesque effect is fully compensated for by the suggestions that each stone, as it passes in review, gives rise to. There are two principal gateways whereby entrance to the city may be obtained, both of which are situated on the southern side of the city. That at the south-western end, is a fine specimen of the engineering and architectural skill of the Knights. It is approached by means of a drawbridge that spans a wide, deep moat, the bottom of which has been converted into a flower-garden. The façade of the gate is still in a good state of preservation; but the walls on either side of it are sorely weather-beaten and time-worn. Within the entrance, and situated on the left hand of it, there is a niche containing a statue in a sadly dilapidated condition. But mutilated as it is, the graceful lines of the human form that the skill of the artist had impressed on the stone are yet discernible. Of its origin little is known, but it is supposed to be a specimen of Roman sculpture; and it is said to represent the Queen of the Roman Pantheon. Almost immediately opposite, and situated on the right-hand side, is the old auberge, which is now used as a sanitorium. Within the quadrangle which faces the building, there is a bust of one of Malta's heroes, of one of that order of brave spirits who devoted their lives to the protection of their more helpless co-religionists; one of that order who, while defending the faith of their fathers, succeeding in inflicting upon the infidel Turks, a series of blows, from the effects of which, even to this day, they have never recovered. The Grandmaster Manoel was not the least of the galaxy whose genius shed such a lustre on the "Order of St. John."

The hand of Time has been laid but lightly upon the old building. It walls are somewhat greyer, and here and there the sirocco has wasted its façade, but besides this there is but little else to testify to the two centuries that have passed over them. But what are two centuries? In comparison with some relics that the city contains, this auberge is but as of yesterday. The foundations of the old city are a very embodiment of antiquity. Phœnician hands have reared their dwellings on its site; and Romans, Greeks, and Carthaginians have alike left evidences of their departed glory in its precincts. The voice of one of Rome's greatest orators was raised in its defence against those of his own countrymen who should have protected rather

than have despoiled. Cicero, in a torrent of fierce invective, denounced the confiscations of Verres, and called for justice for the Maltese people. The Saracens, too, have left their mark upon its walls; while in the more modern name of "Notabile," which has been given to the suburbs that have sprung up around the old town, we have an evidence of the estimation in which it was held by Alphonse the Castilian.

Of the times of the Knights what need is there to speak? Do not the grim old battlements tell their own tale? Do they not conjure up scenes of its history, scenes of bloodshed, of suffering, of death? No one, methinks, could enter that old gateway, and ramble among those ruined ramparts, without calling to mind some of the bloody incidents that have been enacted within them.

At the northern extremity of the bastions stands the cathedral church, a noble edifice, built in the Corinthian style of architecture, and embellished within and without with all that art and money can supply. Its interior is impressively grand. The reliquaries of ancient Christendom that are contained within its walls, are numerous and of the greatest interest. A picture of the Madonna, said to have been painted by St. Luke, and several relics of the Apostle of the Gentiles, are among some of the most precious of them. Within the tabernacle of the high altar are the paten and chalice with which St. Paul and his asserted successor St. Publius administered the sacrament to the converted Maltese.

The paintings, carvings, and other works of art have all been made subservient to one end, namely to divert the attention of man from the vanities of this world, and to divert his attention to the glories and happiness of the next. The very stones with which the floors are paved, with their inscriptions and symbols of death, preach monitory sermons to their readers, and serve to remind them how fleeting is man's existence here.

From the belfry of the cathedral a splendid view of the island is to be obtained. If the day is clear and fine, even Etna may be seen in the distance. To the west and south-west a curtain of hills shuts in a scene that is made up of an undulating and freely diversified country, studded with the cultivated patches of the husbandman, and bespeckled with the churches and dwellings of the peasantry. Looking eastwards the undulating freestone surface of the south-eastern portion of Malta is bounded by the blue waters of the Mediterranean; while to the south several spurs of the Binjemmas jut forth on the plain, and encompass a series of rich and fruitful valleys.

Turning to the north, we see the bay of St. Paul, the scene of the Apostle's shipwreck; while beyond lies the tutelary genius of the island—the sea—dancing and glittering in the sunbeams that move merrily over it, and almost hiding in their silvery sheen the islet of St. Paul, which lies in the background. Villages, churches, farmsteads, and isolated cattle-sheds lie scattered in all directions over the landscape beneath.

Near Maddalena the variegated rock surfaces of the "Grand Fault" of the island lie exposed, and serve as an effective foreground to the water behind. These rocks afford us an excellent example of the influence that the internal structure of a formation has upon the scenery of the country. Wherever the soft freestone, that is the formation upon which the town of Valetta is built, crops out, there low undulating plains and long smooth slopes are formed; and the result is scenery of a tame and monotonous character. But wherever rocks of a harder consistency appear, such as those that occur at Maddalena, on the northern shores of the island, there the scenery is characterised by rugged hills, and scarped and precipitous valleys.

The differences between the district around Maddalena and the plain beneath are more striking in summer than in winter. In winter-time the monotony of the plain is relieved by the vegetation that then covers it. The stone walls partly hidden in a profuse covering of verdure; the blending of rich-coloured soils with the richer colourings of the produce that they bear, the crimson sulla and the golden rye, the brilliant green of the ivy-encircled walls; it is the presence of these that tends to soften down those harsher features that make themselves so painfully apparent in the summer-time. In winter the scene is as pleasing, as in summer it is intolerable.

But though all around is constantly changing, yet the city itself appears to be but little affected. It is true that Time's hands have been laid somewhat heavily upon the bastions and towers; but yet there they still stand, as sturdy and as strong as ever. Its buttresses know not decrepitude; and were the conditions of war but the same now, as when the fortifications were designed, there is little doubt but that they would still be able to prove themselves to be capable of doing yeoman service.

But the times and the manners have changed; and Citta Vecchia has been relegated to the limbo of the past. Its streets are now deserted; its glory has departed. But the place will ever remain green in the memories of those who cherish tradition and its heroes. The city is rich in historical associations, and every stone, had it a tongue, could recount a history as thrilling as any romance of mediæval times. It is rich also in its traditions of by-gone ages; but it is the richest of all in the melancholy memories of the brave hearts that reared its walls, and who os heroically fought and died in its defence.

JOHN H. COOKE.

THE actively peripatetic Geologists' Association made their annual Easter Excursion this year to Devizes, Swindon, and Farringdon, under the directorate of Professor Blake, Dr. Hinde, Messrs. H. B. Woodward, Bell, and Bennett.

CURIOSITIES OF WORM-LIFE.

By the Rev. Hilderic Friend, F.L.S., Author of "Flowers and Flower Lore," etc.

EVERY naturalist is aware of the fact that there is scarcely a plant or animal in existence which is not liable to some peculiarity or other. Among the highest animals we have dwarfs and Siamese twins, not to mention other deformities; while chicks and calves seem especially fond of appearing with two heads or a pair of caudal appendages. Worms are no exception to the rule; but so far as I am aware no popular account has ever yet been given of these freaks of worm-life as a whole, such as we have been favoured with in relation to other animals, as well as plants. During my researches into the habits of earth-worms I have had ample means of studying a number of these peculiarities, some of which are now submitted for the benefit of our readers.

There are several ways in which earth-worms depart from the type. In some instances there is no deformity, but the full-grown worm shows a curious tendency to limit the number of segments. In this way a species which should normally have sixty rings behind the girdle, will have only thirty (Fig. 63.2), so that the girdle comes just in the middle of the body. I have found this tendency in more than one species brought from the Cotswold Hills, in Gloucestershire, which leads me to infer that there is yet a good deal to be learned about the influence of habitat, soil, climate, height above sea-level, and other factors, upon the development of worms. This tendency of the girdle to occupy the centre of the worm's body is quite unlike that which we find in the green worm (*Allolobophora chlorotica*), Fig. 63.1, where the number of segments behind the girdle is usually double that in front. Owing, however, to the hinder segments having a much narrower diameter longitudinally than those in front of the girdle, the girdle here falls nearly in the centre of the body.

A very striking peculiarity has often presented itself in the study of the brandling (*Allolobophora fœtida*). This worm, like the great majority of our native species, has the male pore on the fifteenth segment. If a worm is examined carefully, it will be found that a pair of papillæ, or white swellings, occupy the under surface of the fifteenth ring, counting from the head backwards. These swellings carry a pore, and serve as an important character in the diagnosis of genera. We have one small genus in Britain (Allurus) which carries the male pore on segment 13. Now the brandling is the most variable of all our species, and seems to be in a transition state, for it may be found sometimes with pores normally disposed, at other times with both pores on segment 14, and not infrequently with one pore on the 14th

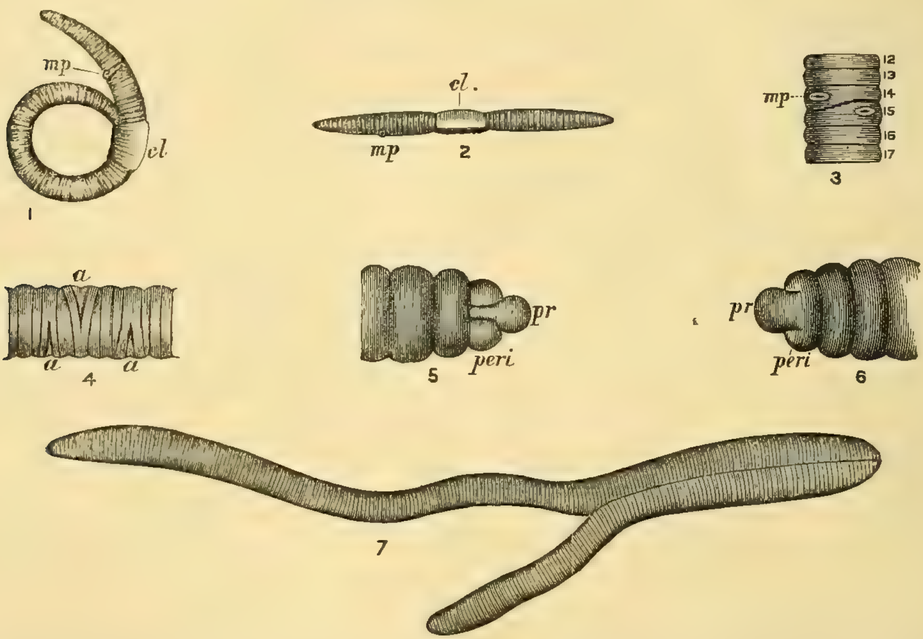

Fig. 63.—1, Green Worm (*Allolobophora chlorotica*) with girdle (*cl*) normally near centre of body; 2, abnormal worm with tail shortened; 3, Brandling (*Allolobophora fœtida*) with male pores (*mp*) on alternate segments, instead of being normally on segment 15; 4, Brandling, showing bands splitting (*a*) in two; 5, typical Lumbricus head, *pr* prostomium, *peri* peristomium; 6, typical Allolobophora head; 7, abnormal form of long worm (*Allolobophora longa*) with double tail. Nos. 3–6 magnified two diameters, the rest natural size.

and the other on the 15th segment (Fig. 63.3). I have found this latter peculiarity also in the gilt-tail (*Allo. subrubicunda*).

Another remarkable tendency of worms is better observed in this species than in any other, owing to its bright, well-defined colour-band. The brandling, as its name implies, is brindled or streaked with brown and gold, and it is no uncommon thing to see the brown bands bifurcating (Fig. 63.4), and splitting up, thus giving a very characteristic zebra-like appearance.

The girdle, or clitellum, of earth-worms is very liable to abnormal development. I found a brandling in Sussex some time ago which was quite a study, on account of its bilateral asymmetry. On the left side the male pore occupied segment 15, and the tubercula segments 28, 29, 30; while on the right side the pore was on segment 16, and the tubercula on 29, 30, 31. Another worm found at Bolton Woods, in Yorkshire, displayed the girdle bulging out at one side of the body, instead of forming a saddle on its dorsal surface.

These, and many other little freaks of nature, however, which might be mentioned in connection with the colour, shape, and development of worms, sink into insignificance in presence of the forms now to be described, although the facts are not new. I received early in March a curious specimen of the long worm (*Allolobophora longa*), a worm which has all along been confused with the common earth-worm (*Lumbricus terrestris*, L.). The two may be easily distinguished by the shape of the head or prostomium, the colour of the body, and the position of the girdle. In the earth-worm, which is a true Lumbricus, the prostomium cuts (Fig. 63.5) the first segment entirely in two, the colour is purplish-red with lighter-coloured tail, and the girdle begins on segment 32. The long worm has a prostomium only partially inserted in the first segment (Fig. 63.6); it is usually a very dark sienna-brown, and has a girdle extending from segments 28 to 35.

My specimen of the long worm was found at Hungerford, in Berkshire, and was sent to me by Mr. Winkworth of London. It is a sample of the "double monster," very similar in every respect to several which have been described in various scientific journals within the last few years. I will first of all describe the specimen, then give some details as to earlier specimens.

The worm is about five inches in length, and would be described by the angler as a maiden dew-worm. It has no girdle, the anterior portion of the body when living was the usual deep sienna, the posterior nearly flesh-coloured. Three-fourths of the body, from the head backwards, are perfectly normal, and consist of 110 segments. From this point the tail becomes twice the usual size, assumes a somewhat quadrangular shape, and gives off a branch which, like the thickened portion, is a quarter the length of the worm's body. The drawing (Fig. 63.7) will make the matter clearer than any mere verbal description. The thickened tail and the branch alike consist of 60 segments. The total number of segments therefore in one axis is 170, and this is the average number for the long worm. An exactly similar specimen was described by Mr. Broome in 1888 ("Trans. Nat. Hist. Soc. of Glasgow," p. 203), but it is erroneously named the common earth-worm. The worm was about four inches long, and at a distance of three and a quarter inches from the mouth the body divided into two unequal parts, each furnished with an anus. The longer of these two parts lay in the same axis as the rest of the body, while the shorter branch projected from the main trunk. Other specimens are on record as follows:—In the catalogue of the Teratological specimens in the Museum of the Royal College of Surgeons, published in 1872, is a description of an earth-worm with the posterior third of the body symmetrically double. This specimen was presented to the College in 1810, by W. Clift, Esq. In the "Quart. Journal Mic. Soc.," 1867, vol. vii. p. 157, we find a note on a double earth-worm by Mr. Robertson. He calls it *Lumbricus terrestris*, but in those days every worm bore this title, and it would be interesting to know what species is really intended. It is now in the University Museum, Oxford. In 1871, Mr. Breese, as President of the "West Kent Nat. Hist. Soc.," made use of this paper and its accompanying illustration, but threw no further light on the subject, so far as one can gather from the abstract of his presidential address. Professor Jeffrey Bell has a notice of two Lumbrici with bifid hinder ends in "Ann. Mag. Nat. Hist.," 1885, vol. xvi. p. 475. In February, 1891, Mr. Foster exhibited to the "Hull Scientific Club" a specimen of the common earth-worm (query species) "which possessed an appendage appearing like a double tail."

When I was at the Zoo the other day, Mr. Beddard, our leading authority on worms, showed me a specimen of the long worm in every way like the specimen from Hungerford now in my possession.

The foregoing exhausts all the references I have at present to this form of monstrosity in British earth-worms. To attempt an explanation of these peculiarities here would involve both space and technicalities and I must be content to refer the reader to the articles already named for a discussion of this branch of the subject.

NOTES ON MANX PLANTS.

THE flora of the Isle of Man is not numerous in species, nor are there many rare plants to encourage the specimen-hunter. Its isolated position even shuts out some quite plentiful on the other side of its boundary waters. Yet there is no lack of flowers in Man, and some beautiful and interesting

plants do their utmost to make up, by their abundance for the lack of others. Some notes on the characteristics of the island's botany may not be unwelcome, especially in view of the number of your readers who annually visit our shores.

Perhaps the most striking features of our plant-life are to be seen on the sea-coast. This consists of rugged cliffs for the greater part of its circuit, and these, especially on the bold and picturesque western side of the isle, often present a luxuriant vegetation. On their dry tops, or on the earthen fences which shut off the cliff-edge from the cultivated land, *Sedum anglicum*, our only common stone-crop, opens its myriads of starry spotted flowers. From the broken ground spring the kidney-vetch (*Anthyllis vulneraria*) and hare's-foot trefoil (*Trefolium arvense*). Where the rock splits into ledges, and water drips through its crevices, *Cochlearia officinalis* covers it with a snowfall of blossom. The common companion of the scurvy-grass is the sea-feverfew (*Matricaria inodora*, var. *maritima*), with its flowers so like dog-daisies. On both rock and earth is the straggling bushy growth of *Spergularia marina*. Great cushions of sea-pink (*Armeria maritima*), crowned with their many rosy clusters, sprout from the cracks, mingled with the pale-green foliage and reticulated calyces of the sea-campion (*Silene maritima*). Beds of samphire, recognised far off by its strange glaucous hue, cover here and there long ledges, usually out of reach. But the loveliest sea-plant of all is the vernal squill (*Scilla verna*) abundant on all our rocky coasts, and sometimes, as at Cronk Moar in Rushen, straying a little inland. Often the grassy sea-margins are so profusely sprinkled with these faintly-scented dwarf hyacinths, that they give the prevailing colouring to the brows. On the west, steep and stony ground is sometimes covered by a huge and rank growth of the common nettle. Below, where boulders and fragments fallen from above form a rough kind of beach, overhung by the great rock-masses, vegetation is scarcer. Bits of sea-spurrey still grow wherever they can find a rooting-place. The stones are thinly sown with the straggling mealy stems of a slender and not ungraceful form of atriplex (? *deltoidea*). Sometimes there is a little yellow stonecrop (*Sedum acre*). Sometimes the pretty foliage of the sea-milkwort (*Glaux maritima*) turning a beautiful yellow in autumn, carpets the ground between the boulders, and in some stony spots, which it has nearly completely to itself, the common silverweed (*Potentilla anserina*) has a singularly delicate appearance. A plant very common, on these strands, or, as they are called in the Isle of Man, "Traics," where a stream trickles from the rock, is the tall, rough hemp-agrimony (*Eupatorium cannabinum*), its dull flower-heads and abundant foliage not unpicturesque amid its surroundings. Trace up the water a little further, if the ascent be not too steep, and you will find brookweed (*Samolus valerandi*), and perhaps, for it is not very frequent in Man, a few of hart's-tongue fern (*Scolopendrum vulgare*), or the high stem and golden lamp-like flowers of the tutsan (*Hypericum androsæmum*). But where the cliff is hollowed out into a cavern, or a long recess slopes away into blackness, you will see in profusion the rich glossy fronds of the sea-spleenwort (*Asplenium marinum*). Sometimes a mossy projection jutting from the darkness of a great cave is completely draped with this fine fern. Great tufts of it, somewhat ragged and stunted from exposure, and mixed with immense growths of sea-spurrey, spring from the ruinous walls of Peil, "a castle like a rock upon a rock." By careful search a rarer fern may be found. The maiden-hair, though sadly thinned, still lingers in some dripping cavernous places, on the west coast. *Asplenium adiantum-nigrum* is frequent on the coast also, more out of reach of the tide than *A. marinum*. The sea-kale grows in a few localities; and among the débris of the low rocks, on the south, the flaunting flowers of the horned-poppy may be gathered, and even the hen-bane, though that is uncommon in Man. *Euphorbia Portlandica* is found on stony rubbish at a wild strand on the east coast. The extreme north of the island is a sandy and comparatively level district, with a coast sometimes flat, but usually rising into cliffs of sand and clay. This has its peculiar flora, but most of the plants are those to be found on every similar shore in Britain. The gay carpet of the sandy pastures is largely composed of bird's-foot lotus (*L. corniculatus*), and rest-harrow (*Ononis arvensis*), the form seeming to be always *repens*, sometimes with the addition of *Ornithopus perpusillus*, and dotted with the common pink stork's-bill (*Erodium cicutarium*). On the sands sea-rocket (*Cakile maritima*) and salt-wort (*Salsola kali*) are abundant, and on the shingle above high-water mark, sea-purslane (*Honckenya peploides*). *Eryngium maritimum* adds to the prevailing blue-green of the great masses of sea-reed. The field-borders are bright with the common vetch (*Vicia angustifolia*. The rare *Brassica monensis*, which seems to have been named by John Ray from specimens gathered on the "Mooragh," at Ramsey, is still found there and at other spots; and in the neighbouring salt-flats tidally overflowed, the glass-wort (*Salicornia herbacea*) flourishes in the bare, muddy spaces between tufts of sea-pink.

The deep glens which seam the mountain-land so profusely have a rich vegetation, often in strong contrast with the bareness of the hill-masses among which they are hidden; but here, too, few prizes will be found. On very damp stony places, under the deep shade of rock and wood, are great clusters of yellow-green *Chrysosplenium* (*oppositifolium*), and wood-anemones thickly star the stream-sides along the branches of the Glass and Groudle brooks, and in some of the northern glens, and complete the spring charm of hyacinth, primrose, and dog-violet. Wood-sorrel is wonderfully abundant, and golden-rod

(*Solidago virgaurea*) and tutsan frequently spring from the rocky sides. Ferns of course there are in profusion, and from them the ravines derive their greatest beauty. On the ledges the common polypody often attains a great size. The mountain-buckler fern (*Lastrea oreopteris*) is very noticeable by its frequency and luxuriance. The royal fern (*Osmunda regalis*) is found in glens, on bog-land, and even on wet seaside rocks (as at Fleshwick), and cart-loads of these fine plants are taken from the northern "Curraghs" to Douglas, for sale on market-days in summer.

The stony rubbish of the South Barrule granite quarries is green with parsley fern (*Allosorus crispus*), which inhabits some other spots also, but is not common. Gorse is specially abundant and luxuriant in Man, the large kind (*Ulex Europeus*) brightening the high sod fences which form the field-boundaries, "never out of blossom," the Manx saying tells us, "while kissing is in fashion," and the smaller (*Ulex nanus*) combining with the heather to cover great tracts of land. The three common kinds of heath are all, of course, plentiful, but perhaps the most striking is the profuse and brilliant *Erica cinerea*, which, however, is becoming rusty by the time the less showy ling is at its best. Common accompaniments of heather and gorse are the milkwort, its varied-coloured flowers thick in the springy hill-side turf, eyebright, and, along fences and dry-stone walls, foxglove. Where wet spots occur amid the heathy ground, the seeker will be rewarded by a more extensive range of plants. One such place recurs to my memory while I write, and I will describe it as an example of many similar. A strip of waste land fills the bottom of a sequestered valley, not a quarter of a mile broad. On the left-hand side, looking up the valley, and close to the bounding hill, here shaded by a plantation, rises a rocky natural eminence, rough with bramble and bracken, its top surrounded by the grassy mounds of a prehistoric fort, from among which springs a clump of Scotch firs. On the right is a long and broken dry-stone wall, below which the ground falls rapidly to the rushy borders of an old watercourse, now almost choked by weed. On this ground the mountain sweet fern grows, its nearest station to Douglas. Further off in the same direction is the river, a swift hill-stream whirling down over its gravelly bed, a pair of sand-pipers flitting along its margin, the heavy flight of a heron moving lazily up the valley overhead. Between the river and the watercourse the ground is covered with gorse and rank grass, and the low bushes in early summer are rich with the creamy blossoms of the burnet-rose (*R. spinosissima*), a most abundant species here. All over the waste, and on every rough hedge-bank for miles, are the golden flowers of the St. John's wort, well-named "pulchrum," one of the commonest and loveliest of Manx wild plants. It is the "Luss-y-chialg" of country people, who still use it as a tonic.

But just before us a little stream, oozing from the hill, finds its way into the watercourse, and before reaching the dry-stone wall soaks a bit of the heath-land. Looking closer at this spot, we are aware of its gorgeous colouring: rose, crimson, orange, and cream-colour. There are the waxen bells of the rose-heather (*Erica tetralix*), there the spikes of the bog-asphodel (*Narthecium ossifragum*), and the curious strong-scented heads of *Hypericum elodes*. The spotted palmate orchis (*Orchis maculata*), is abundant; it is the only orchis at all common in Man, and strives, by its appearance in every marshy spot, to make up for the absence of its relatives. The marsh red-rattle (*Pedicularis palustris*) rises near the stream-side, less common than the smaller species, which is very abundant in the island. The common butterwort (*Pinguicula vulgaris*) rears its graceful flowers like long-stalked violets, from the unctuous leaves, and the pale butterwort (*P. lusitanica*), a by no means unfrequent plant with us, shows its thinner foliage and lighter-tinted flowers near the trickling water, scattered here and there. There is a plentiful undergrowth of sundew (*Drosera rotundifolia*), and of the marsh-pennywort (*Hydrocotyle vulgaris*), the supposed effects of which have suggested the curious Manx saying, "Cha nee tra ta'n sheyrrey gee yn ouw te cheet rée." "It's not when the sheep eats the 'ouw' that it (that is, the harm) comes to her." What is intended to be illustrated is the certainty of the evil effects of wrong-doing, though their working may be slow. Bog-pimpernel also, not less delicate in its foliage than in its blossoms, mixes with the red of the sundew leaves.

In the northern "curragh" or fen, where the wet land is extensive, other and some rarer species might be noted. In anything like a pond or piece of still water the bog-bean is sure to be found. Wet places usually yield *Viola palustris*, often *Epilobium palustre* and *Scutellaria minor*, sometimes *Veronica scutellata* and *Campanula hederacea*, and it is said, *Radiola millegrana*, and *Centunculus minimus*; but the plants just described are the most ubiquitous and conspicuous.

Amidst our roadside vegetation the English botanist will miss *Lamium album* and *Sisymbrium alliaria*, but he will be struck by the abundance of tormentil (*Potentilla tormentilla*), wild sage (*Teucrium scorodonia*), Pepperwort (*Lepidium campestre*), and wall-pennywort (*Cotyledon umbilicus*). Here and there the rose-bay willow-herb (*Epilobium angustifolium*) decks the hedges. The ivy-leaved toad-flax, another stray of cultivation, grows frequently on walls and cottage-roofs. Quite a feature of Manx roadside waste places, especially in the south, is *Smyrnium olusatrum*; its vivid and glossy foliage is luxuriant in the neighbourhood of the old abbey of Rushen, and along the straggling high-road streets of the Southside villages. In this part of the island, where limestone takes the place of the prevailing schist rock, the vegetation somewhat changes. *Potentilla reptans*, scarcely seen about Douglas, becomes plentiful by

the foot-paths; the hemlock, found also in the sandy north, reappears on the waste ground; and the fields are rich with scarlet poppies. The great hairy willow-herb (*Epilobium hirsutum*) appears by the stream, the water-plantain (*Alisma plantago*) in still water, the burdock (*Arctium lappa*) is more frequent, and *Scandix pecten-veneris* springs on cultivated ground.

It is noticeable that the cowslip is not found in Man except where planted. Lamb's-lettuce (*Valerianella olitoria*) and yellow toad-flax (*Linaria vulgaris*) are local, and seemingly recent. *Veronica Buxbaumii*, however, which must be a late introduction, is abundant, and has spread to remote corners of the isle. The white meadow-saxifrage (*Saxifraga granulata*) I have seen only on one spot, a grassy brow on the western coast.

Something might be said, did space permit, on Manx plant-lore; as the use of the mountain-ash (Manx, "Cuirn") in connection with May-eve superstition, of the elder (Manx, "Tramman") as a protection against charming, and of many wild plants as rustic medicines. Some curious information on these subjects will be found in the recently published "Folk-lore of the Isle of Man," by Mr. A. W. Moore.

P. G. RALFE.

SCIENCE-GOSSIP.

ONE of the greatest modern scientific satires is that "Water finding," by means of a hazel wand, is revived! It is so much easier than studying geology, and receives, as a rule, more of ecclesiastical support.

THE Council of the Wesley Scientific Society met in London on March 31st, under the presidency of the Rev. Hilderic Friend, F.L.S., and resolved to canvass the members and subscribers with a view to the re-organization of the Society, and the monthly issue of a superior Journal, to contain illustrated articles, original memoirs, summaries of work done by other Societies and individuals, and other matter of interest to students of science and natural history. Great regret was expressed at the injury sustained by the Society, owing to the unwarranted amalgamation of the "Wesley Naturalist"—the former official organ of the Society—with another periodical, and the mind of the members is now being ascertained respecting the reconstruction and more efficient working of what has proved itself to be a very useful, and necessary organization.

THE following are among the Lecture Arrangements at the Royal Institution, after Easter: Professor T. G. Bonney, Two Lectures on "The Sculpturing of Britain—its later stages," (the Tyndall Lectures); Mr. Frederic E. Ives, Two Lectures on "Photography in the Colours of Nature; Professor Dewar, Four Lectures on "The Chemistry of Gases; Professor H. Marshall Ward, Three Lectures on "Some Modern Discoveries in Agricultural and Forest Botany" (Illustrated by Lantern). The Friday Evening Meetings were resumed on April 29th, when a Discourse was given by Dr. William Huggins, on the "New Star in Auriga;" succeeding Discourses will be given by Captain Abney, Dr. B. W. Richardson, Mr. J. Wilson Swan, Professor Dewar, and other gentlemen.

MESSRS. TEMPÈRE AND DUTETRE announce the publication of a series of slides, to be accompanied by Explanatory Text, on "The Micro-Fungi of France."

THE latest news from the newly discovered Dover coal-field, is that 762 feet of coal-measures have been penetrated beneath the cretaceous and oolitic rocks. At the depth of 1,140 feet, a coal-seam 2 ft. 6 in. thick, was passed through. The depth now reached, is 1,875 feet, and nine seams of coal have been pierced.

WE are pleased to draw attention to M. Tempère's "Memento du Catalogue de Préparations Microscopiques" (168 Rue St. Antoine, Paris). Microscopists will find it very useful.

A DESCRIPTIVE pamphlet has been issued relating to the programme of the Edinburgh Summer Meeting of Art and Science in August next. It is a delightful programme—botanical rambles, zoological dredgings, microscopical investigations, demonstrations, conversaziones, and lectures galore!

MR. G. VINEY says:—"A splendid specimen of a female great northern diver has been captured at St. Anne's-on-Sea, Lancashire, lately, and is now in the possession of Mr. Oldfield, Church Road. There has not been one seen here for a dozen years till now."

WE heartily welcome another magazine, "The Irish Naturalist," edited by Messrs. G. H. Carpenter and R. Lloyd Praeger, the first number of which has just been published (London: Simpkin & Marshall), price 6*d.* It will be devoted mainly to Irish geology, botany, and natural history generally.

WE have received a copy of Mr. Arthur Bennett's valuable paper entitled "Records of Scottish Plants for 1891," an addition to "Topographical Botany," reprinted from the "Annals of Scottish Natural History."

MR. J. A. ELLIS, 1 Pomona Place, Fulham, writes as follows:—"Last year, through the kindness of several subscribers of SCIENCE-GOSSIP, I was enabled to form several natural history collections for the schools in our vicinity. I desire to do the same this year, and should be greatly obliged to readers having duplicate Botanical, Entomological or Geological specimens, if they would forward them to me. Specimens of foreign and colonial seeds, fibres, etc., used commercially and medicinally, are especially desired."

MICROSCOPY.

A NEW MICROSCOPICAL LAMP.—The microscopical Lamp which I have designed, and of which I send a rough sketch, has, I venture to think, some distinctive advantages. (1) The form of base gives a good support, and by allowing a foot of the microscope to rest between two of its feet, admits of the flame (which is at the outer circumference of the oil container) being brought close to the stage of the microscope. (2) The screw motion sliding gear fixed on top of the base, admits of a lateral movement of half an inch on each side of the centre of the base, thus facilitating exact centering of the light. (3) The oil container, having the pillar passing through its centre, causes the lamp to be more evenly balanced all round; if necessary, the oil container could be slightly weighted on the side opposite to the burner. (4) The container being shallow, and the foot also being shallow, the light can be brought close to the table, or it can be raised above the stage for use, with a condenser above the stage. (5.) The pinching collar provides a very efficient and facile control over the vertical movements of the lamp. The letters on the sketch with the accompanying description give a full explanation of the lamp.—*J. A. Ross, M.D., Folkestone.*

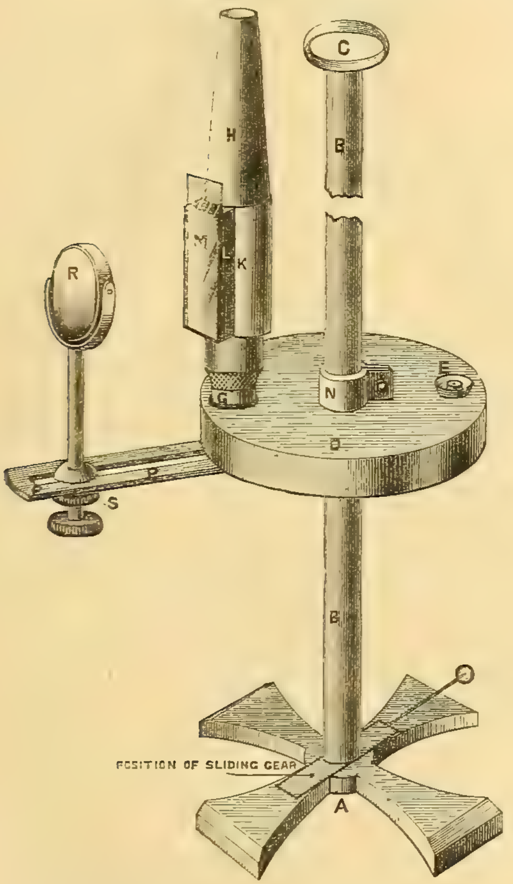

Fig. 64.—A, base, with four feet which have cork or caoutchouc studs underneath, the base to be of somewhat larger diameter than the oil container. This base can be fitted with a sliding gear, as Figs. 66 and 67, giving the lamp a lateral movement of ½ inch on each side of the centre of the base, thus facilitating exact centering of light without moving the base. B, pillar. To prevent rotation of lamp the pillar could be made square, or have a narrow and shallow slot cut in it, and a pin could be passed through the collar into the slot. C, ring at top of pillar for carrying lamp. D, oil container; diameter 6 inches, with filling hole (E). G, rotating burner with ¾-inch wick: half a revolution, by means of a revolving collar with stops, can be given to burner, to admit of the use of the flat flame or of its edge. H, metal chimney; dull black inside. K, box or wider part of chimney surrounding flame. L, projection from box for holding glass slips. M, glass slip in place. N, pinching collar with screw at side. P, arm for carrying condenser; it rotates. Not drawn to scale, but drawn too long. R, condenser (not drawn to scale). S, screw arrangement for fixing condenser. T, horizontal section of pinching collar. V, another form of collar which could be substituted for the pinching collar. It has a screw acting on a brake, which, being a segment of a circle, does not damage the pillar. W, horizontal section of same, showing brake worked by screw. Scale 1 = 2 (about).

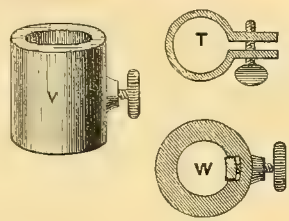

Fig. 65.

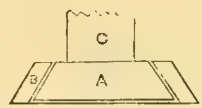

Fig. 66.—Vertical section at middle of sliding gear for fitting over the base; showing the pillar. Not drawn to scale.

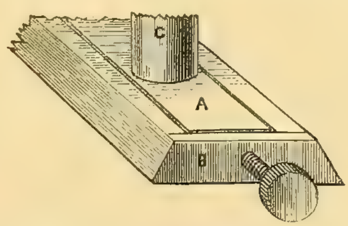

Fig. 67.—Sliding gear showing screw stem, which can be made long enough to project just outside the feet of the base to facilitate turning the screw. Not drawn to scale.

TYLAR'S MICRO-PHOTOGRAPHIC CAMERA.— Mr. W. Tylar, 57 High Street, Aston, Birmingham, has kindly forwarded to us an ordinary specimen of the above apparatus. It is neatly packed into a well arranged case, and is accompanied with all the accessories necessary for micro-photography. The price, even in these days, is marvellously cheap, and it can only be due to the number demanded of Mr. Tylar that the instrument can be turned out at the price. With it, anybody who is even only slightly

acquainted with the ordinary use of the microscope can successfully turn out micro-photos after a very little practice. The apparatus sent out with Mr. Tylar's Micro-photographic Camera is accompanied with a prettily got up brochure containing full instructions how to use every appliance included. This has been written purposely for beginners. Naturalists, as a rule, are not people of enormous incomes or bloated fortunes, and to them this twenty-seven and sixpenny fully equipped instrument, which will enable them to photograph microscopic objects, is a decided help-meet, and cannot fail to intensify their quiet delights in natural history pursuits and studies. The camera itself is an elegantly and artistically turned out bit of work, made of polished mahogany. Mr. Tylar has decidedly made a hit in bringing out at so moderate a price, an instrument which hundreds of ardent but impecunious microscopists have long required.

WATSON'S ILLUSTRATED CATALOGUE.—To a microscopist and naturalist, the perusal of such a well got up catalogue as the present is as enjoyable as a first-class catalogue of rare and valuable books is to a bibliophilist. If he cannot afford to purchase them, nevertheless he is happy that there are such things in existence, ready for him, if he only had the money.

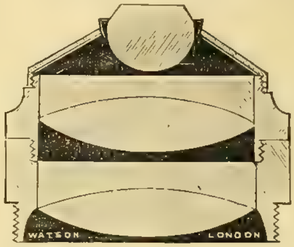

Fig. 69.—Achromatic Condenser. This is specially designed for use in photo-micrography, but it is also efficient for visual work. It does the work of the Abbe Illuminator, and transmits a rather larger aplanatic cone of light. It is strongly recommended where critical photographic work is to be done. It may be used with the highest power objectives, and by removing the top lens can be used with the lowest powers. The new Schott glass is employed in its construction.

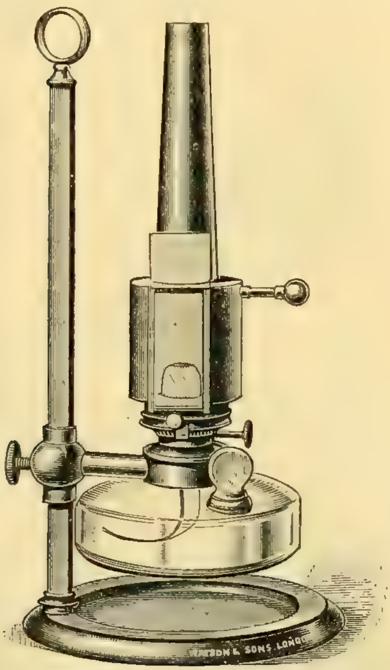

Fig. 68.—This microscope lamp is fitted with a metal chimney, having extra large body allowing of free combustion, and fitting to receive ordinary 3 in. by 1 in. slips. The trouble of broken glass chimneys is thereby avoided, and as the inside is blacked, double reflections are prevented. The container being very flat, the light can be brought down very near to the table; the stopper is built up from the reservoir, thereby obviating the unpleasant leaking usually found in flat lamps. The supporting bar being square, the lamp is very rigid and has no tendency to swing round as on a circular tube. It burns for ten hours. Best paraffin oil should be used.

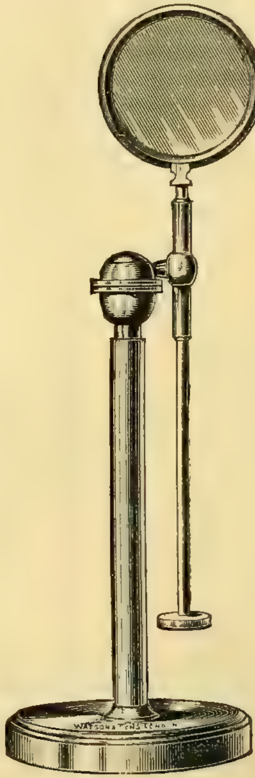

Fig. 70.—New Aplanatic Bull's Eye or Stand Condenser (as suggested by Mr. E. M. Nelson). This form is designed to minimise the large amount of spherical aberration given by ordinary stand condensers; with it a considerably increased brilliance of illumination is obtainable. It is composed of two lenses. Its use is specially indicated in photographic work, and it will be found to not only shorten the exposure, but materially improve the image.

Messrs. Watson & Sons, 313, High Holborn, have just sent out their "Illustrated Catalogue of Microscopes, Objectives, and Accessory Apparatus." The latter

is a very comprehensive term, and the microscopic student cannot fail to be both interested and instructed by the full and clear accounts and pictures of hosts of "Accessories," of many of which he was probably ignorant before. The letter-press runs to 68 pp., and there are about one hundred illustrations, all well got up, as will be seen by the accompanying figs. from blocks used in the catalogue, and kindly lent us by Messrs. Watson. The first thing for students and intending purchasers, is to obtain one of Messrs. Watson's Catalogues, and, after going over it, to use their own judgment.

MICROSCOPIC POND-LIFE IN WINTER.—In September 1891, while out in search of micro-organisms, I dipped my collecting-bottle in a ditch at Hook, near Goole, and was rewarded by at once perceiving numerous tubes of Melicerta on the under side of the leaves of duckweed. The ditch was broad and deep, protected on one side by a high, but straggling and open hedge, and on the other by a raised portion of the field. It had been partially cleaned out by the farmer; possibly harvest operations had prevented the completion of the work—very fortunately for me, for it proved rich in interesting forms of life. For one half of its length the ditch contained clear water only; the other half was covered with a dense sheet of the ivy-leafed duckweed (*Lemna trisulca*). Some of the leaves of duckweed had as many as six specimens of *Melicerta ringens* on their lower surface, and examination under the microscope also revealed the presence of *Floscularia ornata* and *F. cornuta* in great abundance. *Arcella aculeata*, *A. vulgaris*, and *A. dentata* were also present, the latter species being the most numerous. From time to time throughout the winter, in all kinds of weather, I made occasional visits to the ditch. As the autumnal rains increased, it gradually filled up, and finally overflowed; but the Lemna kept together in considerable masses, and only on one occasion was my search for organisms unsuccessful. Late in October, after a fortnight or more of very heavy rain which had flooded many parts of the country, in addition to *M. ringens* and the Flosculariæ, I obtained *Mastigocerca carinata*, *Pterodina patina*, *Colurus deflexus*, *Kerona mytilus*, *Actinosphærium Eichornii*, *Actinophrys sol*, *Stentor Mulleri*, *Euglena viridis*, and the Arcellæ previously mentioned. *Hydra viridis*, Entomostraca, and minute Infusoria (Peridinium and others) were very plentiful. Throughout November the same species continued to flourish in undiminished numbers. On the 20th December, after three days' keen frost, the ditch was covered with a coating of clear ice about three quarters of an inch thick. The duckweed, still in dense patches, could be seen beneath the ice; not frozen into it. On breaking the ice, and transferring a quantity of duckweed to the collecting-bottle, the pocket lens showed that the water was simply teeming with microscopic life. On examination with the inch objective, the field was seen to be crowded with *Eosphora aurita;* next in abundance was *Mastigocerca carinata;* and then, also in considerable quantity, *M. ringens*, the Flosculariæ, Tardigrada, and a species of Synchæta, possibly the form described in "Pritchard's Infusoria" as *S. tremula.* I may mention that a friend to whom I sent a portion of this "dip" observed an adult specimen of *M. ringens* swimming freely without a sheath; a most unusual thing. During a sharp frost in January, or early in February, the duckweed was frozen into the ice, and when a slow thaw ensued, was left lying on the top of the partially melted ice-sheet, in a semi-moist condition. Under these circumstances tube rotifers were hardly to be expected, nor did I find them. The tubes of Melicerta were there, but they were evidently old ones, and of Floscularia there was no trace. A few Rhizopods and common Infusoria were present. Fragments of ice containing Lemna only yielded the common *Vorticella nebulifera* and numerous lively Nematoids. Towards the end of February Entomostraca became more numerous, and *Dioptomus castor* made its appearance. As the mild weather approached, the ditch again teemed with Infusoria, sometimes one type predominating, sometimes another. *M. ringens* is now present but very sparingly, and Floscularia has not reappeared. In the above record only the more noticeable and interesting organisms are mentioned. Other Infusorians were collected in almost every "dip," and on two occasions species were observed by a correspondent to whom portions of the gatherings were sent, which were not described in either Pritchard or the Micrographic. Had collections been made throughout the whole district, instead of from one single locality, no doubt the list would have been very much extended; but enough has been said to show that "pond naturalists" should not relax their researches during the inclement months of the year.—*C. L. Lord.*

ZOOLOGY.

EXTINCTION OF THE LAPWING.—Your correspondent, Mr. Ward, appears to have quite misapprehended the paragraph he refers to, which related to the great numbers of lapwings' eggs which are taken for consumption at the breakfast-table, but which did not state that naturalist dealers and collectors sell or take any considerable number of lapwings' eggs. Surely it is quite absurd to suppose that the comparatively small number of lapwings' eggs taken by egg collectors and naturalist dealers affects the numbers of the bird to any appreciable extent, as it is so generally distributed throughout the country. Such absurd attacks are only likely to bring ridicule upon those who make them, and to do harm to the cause of bird protection in the end. In my opinion it is the desire of collectors to possess

British killed specimens of rare birds, and eggs taken in Great Britain, that has to answer for the rarity and extinction of some of our birds, and as long as men can be found willing to give long prices for such specimens, so long will the birds be slaughtered directly they reach these shores, or their eggs taken directly they attempt to nest. If men must collect birds and eggs, let them be content to obtain their specimens of British rarities from foreign places where the particular species is abundant, then there may be some chance for such beautiful visitors as the golden oriole and hoopoe to live and nest after they have reached England.—*E. W. H. Blagg, Cheadle, Staffs.*

and that they differ in some important particulars from the members of the genus Lumbricus on the one hand, and Allolobophora on the other. These researches are being laid before the Linnean Society of London, and will probably form the subject of a paper to be read at the forthcoming meeting of the British Association in Edinburgh.

MALFORMATION OF PERIWINKLE.—I send you herewith sketches of a curious malformation in the shell of a periwinkle. Having noticed more than one record of similar monstrosities in land-snails, in your journal recently, I thought that this might possibly prove of interest. The second mouth appears to be

Fig. 71.—Head of Fowl with curved upper beak.

somewhat clumsily attached to the shell, and the original one is somewhat damaged. Is it possible that the periwinkle preferred making a new orifice to repairing the old one?—*J. Holloway.*

SINGULAR BEAK OF FOWL.—I take the liberty to send you a rough sketch of the head of a fowl, showing the curved and hawk-like shape of the upper mandible of the beak, giving the head the appearance of a bird of prey.—*J. Boggust, Alton.*

IVORYINE TABLETS.—We beg to call the attention of working naturalists and curators generally to the Ivoryine Tablets recently brought out by Mr. W. Tylar, 57 High Street, Aston, Birmingham. They are specially prepared for labelling cabinets, boxes, drawers, and natural history specimens. Pencil-marks are easily removed from the Ivoryine label by a damp cloth. The tablets are very useful and very cheap—1*s.* 6*d.* per. dozen.

A NEW BRITISH WORM.—A new British worm, known as *Tetragonurus pupa*, Eisen, has recently been discovered by the Rev. Hilderic Friend, F.L.S., who has also been able to settle a moot point in relation to a group of tree-worms (Dendrobæna), whose exact position among the Lumbricidi has hitherto been but imperfectly defined. It is now found that some half-dozen species of worms live largely among decaying timber and vegetable refuse,

BOTANY.

FALL OF THE LEAF IN TREES.—I have been very much interested in Mr. Whitaker's notes on trees. In respect to the "Varying Fall of Leaf in Oaks," I may remark that I noticed parallel cases in this neighbourhood last year, but the trees were ashes. In more than one place I observed trees within a few hundred yards of each other, one retaining its full foliage, having a slight yellow tint as the only sign of approaching winter, some quite bare of leaves, with others in intermediate conditions. I have never seen the contrast so marked in any previous year.—*W. A. Gain, Newark.*

PRICKLY HOLLY.—Being but a young beginner of the study of Botany, I should be pleased if the following matter could be explained. It is said in most books treating on the subject, that the prickles on the edge of

the holly leaf are caused by the parenchyma not being so fully developed between the extremities of the veins, thereby causing the leathery and tough edge to project further at the venation, and thereby developing spines; and that when grown in rich luxuriant soil this prickly character of the leaf is suppressed by the extra flow of sap, causing the parenchyma to fill out the leaf to its entirety. I herewith send you a specimen of a holly leaf, that I gathered this morning, with the blade of the leaf covered almost entirely with prickles, as is usually developed at the edge; in my humble opinion, sir, placing the above theory among the "non-positives."—*W. J. Pollard.*

PECULIAR CROCUS.—I have noticed single snow-drops with four petals; but never before to day have I noticed a crocus with eight. We have one in bloom this morning, (a white one) with eight distinct petals, four perfect stamens, and the style divided into four stigmas. I thought possibly this might interest your readers.—*Joshua J. Ashley.*

THE BUTCHER'S BROOM (*Ruscus aculeatus*).—Mr. Clement Reid, F.G.S., has a very suggestive note relating to this most interesting plant in the last number of "Natural Science." He states that it usually "flowers in March, but in the years 1884-7, 1890, 1891, it was flowering freely in November, in Sussex and Hampshire. In November, 1888 and 1889, I was in London and could not observe it. Is this an instance of the premature opening of flower-buds that should be dormant till next spring, or has the plant two flowering seasons in the year? Only a small number of the plants, perhaps one in fifty, produce any fruit, and it is difficult to find a bush bearing as many as a dozen berries. The November flowers seldom if ever produce fruit, the November ripening berries being formed by the March flowers. Is the scarcity of fruit in this country connected with the premature opening of most of the flowers? Whatever may be the reason of this double flowering season, it seems to be a marked instance of the non-adaptation of a plant to present climatic conditions."

GEOLOGY.

GEOLOGICAL SOCIETY OF GLASGOW.—At a recent meeting of this Society Mr. Dugald Bell, F.G.S., read a paper on "The Alleged Submergence in Scotland during the Glacial Epoch," with special reference to the so-called "high-level shell-bed" at Chapelhall, near Airdrie, 512 feet above the sea. This "bed" had been first brought into notice by Mr. Smith of Jordanhill, about forty years ago, and had since been generally accepted as proving a submergence of the land to at least that extent. Its existence, however, rested on very imperfect evidence. It was said to have been found in digging a well near the summit of one of the high ridges of boulder-clay in the district; and was described as a bed of fine reddish clay, about two feet thick, and thinning away rapidly on all sides, lying in a hollow of the boulder-clay, which was fourteen feet or more in thickness, both above and below it. The well seems to have been built up before Mr. Smith had an opportunity of examining the section or the clay, though he got some of the shells that had been found in it, and which were all of one species, *Tellina calcarea.* From that day to this no geologist had seen the clay, though it had been sought for all around, and though another well had been sunk within a few yards of the old one for the purpose of finding it. At the very utmost it seems to have been a limited strip or patch of shelly-clay, intercalated in the boulder-clay, such as had been found in many other localities, and could not fairly be taken as a sufficient proof of submergence. Mr. Bell commented on the many improbabilities which the theory of a submergence and re-emergence to this extent at the period referred to involved, alluding to the highly Arctic character of the shells found, the absence of marine remains from the upper boulder-clay, &c. He pointed out that the locality was quite in the path of the old ice-sheet, and immediately in front of a tract of high ground to the east, which would form a considerable obstacle to its progress. It was in such localities that anything being carried forward by the ice was most likely to be left. This seemed to be in every way the more probable account of this Chapelhall clay, and it ought no longer to be cited as a proof of submergence. An animated discussion followed.

A VERY important paper has just been read before the Geological Society, by Mr. Edw. Wethered, F.G.S., on "The Microscopic Structure, and Residues insoluble in Hydrochloric Acid, in the Devonian Limestone of South Devon." Microscopic examination of the Devonian Limestones of South Devon shows that they have been built up by calcareous organisms, but that the outlines of the structure have for the most part become obliterated by molecular changes, and the limestones are often rendered crystalline. In connection with this the author alludes to the disturbances which have affected the limestones. He finds occasional rhombohedra of dolomite, and discusses the probability of their derivation from magnesian silicates contained in the rocks. A description of the insoluble residues follows. The micas, the author considers, may be of detrital origin, but this is by no means certain; he is disposed to consider that the zircons, tourmaline, and ordinary rutile were liberated by the decomposition of crystals in which they were originally included. Minute crystals, referred to as "microlithic needles," resemble "clay-slate needles," but are not always straight: they occur in every fine residue, and as inclusions in siliceous and micaceous flakes. The siliceous fragments which en-

close them frequently contain many liquid inclusions, which does not necessarily imply any connection between the two, though there may possibly be some connection. Micro-crystals of quartz occur, and have been derived from decomposing silicates. In the discussion which followed, Dr. Sorby said that he was probably the first to study the microscopical structure of the Devonian Limestones of Devonshire, but did so chiefly on account of the valuable evidence they afford in connection with the cause of slaty cleavage. Probably on the whole no group of limestones presents a greater range of characters. Not only must their original nature have varied much, but the amount of the changes due to chemical reactions and mechanical squeezing has been very variable and great. He congratulated the author on having done so much to elucidate the structure of such interesting rocks Prof. Bonney expressed his sense of the great interest of the author's observations. Through the generosity of the latter he had had the opportunity of examining some of these residues, and could fully confirm several of the author's conclusions. He thought that the quartz crystals, which had often a nucleus of silicate, must have been developed rather slowly in the rock. He considered that these investigations were of great value as illustrating the history of mineral growth and development.

NOTES AND QUERIES.

BUTTERFLIES IN N. FRANCE.—I spent a few days last summer at Compiègne (Dept. Oise). In the forest from June 3rd to June 10th I observed *A. Selene* in great abundance; *P. Dorilis* also abundant, but I only took males; *C. Palæmon*, a few worn specimens; *M. Cinxia* a few fresh specimens; *Athalia* very abundant and three *Aurinia*. These Melitææ were very local. In a small reed-covered opening of the forest I took *E. Medusa*, five specimens, just emerged. On the 6th June *Arcania* was first seen, and three days after was very abundant. On the 8th I took three *S. Carthami* in a dry sandy clearing. The weather was very unfavourable; on the 15th I went to Fontainbleau and remained there four days, and took the following: *M. Cinxia* and *M. Parthenia*, in abundance and good condition, *Cratægi*, *Sinapis*, *P. Maera*, *Palæmon*, *S. sao* and *serratulæ* (or *alveus*?), a few of each; two females of *P. Dorilis* and a few *Euphrosyne*, *Alsus* and *Bellargus*. The weather was cloudy most of the time.—*D. Wright.*

EUROPEAN BUTTERFLIES.—I want to spend about a fortnight on the Continent this summer, to collect the above, but I do not wish to go very far; would one of your readers kindly tell me a good place to stop at, where the forests and mountains are accessible, say in the Ardennes or Lower Rhine district.—*D. Wright.*

LEPIDOPTERA IN 1891.—It was a curious fact that although we had so much wet weather last year and the general temperature was so much below the average, lepidoptera did not seem to be in much if any diminished numbers; they were later in their usual time of appearing, that was all. Moths seemed to have been adapting themselves to a sort of aquatic existence, for I saw them, on one occasion at least, flying about apparently unheeding amidst the rain-drops just as a heavy thunderstorm was on the point of leaving off.—*Albert H. Waters, B.A., Cambridge.*

NEO-DARWINISM.—Apparently evolution is not a science at all, it is a belief and a matter of common observation. There are no types, but objects have a character. No two trees of the same species are one bit alike. Entomology is evolution depicted, and when Darwin was the popular idol, I had a chance interview with the late Mr. G. R. Waterhouse, a very eminent entomologist. He was quite aware of what was wanting in Darwin's propaganda, for he said suggestively, it is a question of adaptation, that is, of the organism to its environment, a view now claimed for Herbert Spencer. Entomology is likewise evolution in operation. Last October I found a full-fed caterpillar of the red admiral butterfly at Nantes, in France. Just before the final change the colours of the wings showed through the chrysalis, and revealed that the wings were folded like those of a moth, or, in plain English, that the evolution of the butterfly was in progress.—*A. H. Swinton.*

THE AMERICAN ALOE. — Perhaps some one who has had practical experience of the manners and customs of this plant will favour us with some comment upon the note thereupon on page 70. "Chambers' Encyclopædia" tells us of the agave: "In Mexico these plants usually flower in the seventh and eighth, sometimes even fifth or sixth year, and even in poor soils or exposed situations seldom later than the twelfth year, but in our hothouses not until they have reached a very advanced age (forty to sixty years); whence arises the gardeners' fable of their flowering only once in one hundred years. After flowering, the plant always dies down to the ground, but new plants arise from lateral buds." Doubtless some of your readers, like myself, look to SCIENCE-GOSSIP for reliable information, and for the explosion and not the perpetuation of popular errors. The report like a rifle-shot, and the apparently rapid development of blossoms thereupon, seem to require scientific explanation.—*W. J. Horn.*

ICICLES FORMED FROM EXUDING TREE-SAP.—During the recent frosts a number of trees overhanging a public foot-path were cut back, and on the 6th of March I noticed that the sap which had flowed in consequence had formed icicles of considerable size. The largest were from six to nine inches long, but the average length was not more than three or four inches.—*F. G. Bing, Croydon.*

NATURAL HISTORY SPECIMENS BY SAMPLE POST.—May I be allowed to correct a wrong impression formed by the Rev. Mr. Horsley, from the ambiguously-worded document received by him from the Post Office, on the above subject? A letter referring to the same matter, which I have just received from the secretary of that department, informs me that "the ordinary limits of weight and size for sample packets are applicable" in this case. These limits are not the same for all places; for countries in the Postal Union they are as follows: length, eight inches; width, four inches; depth, two inches; and weight, eight ounces; except in the case of Belgium, Canada, France, Greece, Italy, Japan, Luxemburg, Portugal, Switzerland, the Argentine Republic, and the United States, when all limits are raised by one-half. For non-union countries the limits are the

same as for book packets. It should be remembered that sample packets must not be sealed in such a way as to prevent examination if necessary, and that no writing of any description may be enclosed, although printed papers are allowed. The postage, to any part of the world, is now at the rate of one halfpenny per two ounces, except that the lowest charge is one penny. Sample packets are accepted for registration, and by this means safe delivery may be ensured.—*F. G. Bing, Croydon.*

A Natural Phenomenon, Fireballs at the Cape.—E. S., Cape Town, writes:—"I am glad to be able to say that I saw the phenomenon mentioned by your correspondent H. in Monday's issue of your paper. The first sight I had of the aerolite would be at an angle of about 50 degrees, and bearing roughly east, and vanished at about 10 degrees above horizon in a south-easterly direction. The sight of this falling aerolite was most brilliant—a full sapphire flame of light accompanied by a hissing noise. I saw this phenomenon from the back verandah of a house at Muizenberg, and my time corresponds with H." W. G. writes from 112, Sir Lowry Road:—"With reference to a letter written by H., which appears in your issue of the 1st instant, I may remark that on the day in question I distinctly saw this natural phenomenon. A flash as from a great mirror struck my eyes, and looking towards from whence it came, I saw a ball of fire shoot through the sky and disappear behind the mountains to the east." Mr. S. Riach, Triangle Station, writes:—"As to the paragraph signed H. in your issue or yesterday, I and another here saw the phenomenon on Sunday, 24th ultimo; in appearance it was like a ball of fire slightly elongated. There was no noise when it was first seen, but it seemed to pass through a damp atmosphere when a hissing noise was heard, and a streak of vapour was left in its track. A little further on it appeared to enter a much damper atmosphere, as the sound resembled the noise made when plunging a hot piece of iron into water, and left a large cloud of vapour. The noise then made could have easily been mistaken for a distant peal of thunder. It continued its course afterwards without further trace or noise until it disappeared on the horizon. The time the noise was heard at Worcester was exactly the time the object was seen here, direction was also same." (*Cape Argus.*)—*W. W. Black, Edinburgh.*

Dr. Leefman has just contributed a valuable paper on the important subject of the purification of water. The system has only been tried on a large scale in the city of Antwerp, where the water-supply could only be obtained from the turgid and impure fluid of the river. The water there is now purified by cast iron and steel borings, placed in cylinders so arranged that by a slow rotation the iron may be continuously showered through the water, whilst the latter is being passed through the same cylinder at a moderate speed. The cylinder is provided with pipes, by which, if necessary, the air may be introduced into direct contact with the iron. The iron sometimes, with the carboniferous acid in the water, forms a ferrous carbonate. On exposure to the air it is converted into ferric hydroxide, which settles down rapidly, and carries down with it and oxidises the organic matter. Dordrecht and Paris are now having parts of their water-supply purified in a similar manner. Iron is Nature's chemical filterer, just as chalk and sandstones are her mechanical filterers. It is equally destructive to microbes and germs generally, and the finest water in England is that obtained from the new red sandstone of Cheshire and elsewhere.

Is it not a pity the newly-appointed Professor of Astronomy at Cambridge should be attached to sensational astronomy? His latest prophecy is that the light and heat of the sun will not be available for more than ten millions of years at the most, and possibly not for more than four. This sounds very much like a scientific parody of the Rev. Dr. Cummins and the Rev. Mr. Baxter's Apocalyptic annunciations of the "Speedy coming," etc. The fact is, no conclusions like those of Sir R. Ball can be accepted as having scientific value unless astronomers first know, and are certain, about the actual temperature of the sun. Numerous attempts have been made to determine the latter, and the results have varied from 1,500 to 5,000,000 degrees! Even Sir Robert Ball allows a range of from four to ten million years for the sun's future duration. That gives a very fair margin. M. Chatelier recently demonstrated before the Paris Academy, that the enormous differences in the estimates of the sun's temperature, result from the fact that different laws have been assumed to represent the rate of radiation. He thinks from his own experiments, that the temperature of the sun's actual body (the photosphere) is higher than 7,600 degrees centigrade, but that the effective solar temperature may be put down at 7,600 degrees, owing to the cooling effects of the outer solar atmosphere. Geologists calculate that life has been existing on the earth in past ages for about one hundred million years.

The following is a patent recently taken out which all railway companies interested in the comfort of their passengers will at once adopt, especially as a whole carriage can be fitted up with it at a cost of only £4. It is a railway indicator, which puts up the name of every station in successive order as each is passed, in all and each of the compartments at the same time. This simple plan would be a great convenience to travellers, who would be no longer obliged to strain their eyes to catch the name of a flying station, or to stretch their ears to understand the jargon howled out by indolent porters, or run the risk of being carried past the station they have booked for. It will also abolish those fidgety passengers who seldom travel, and who are continually bothering you, without being satisfied, as to which is the next station.

Once more, says the "Daily News," we are promised photography in colours, but not, we understand, coloured photographs, for it is said that the colours which are taken by the plates need to be projected on to a screen by artificial light. Mr. Frederic E. Ives, of Philadelphia, the inventor of the new process, who has been invited to give two lectures on it before the Royal Society, is on his way from America for this purpose.

NOTICES TO CORRESPONDENTS.

To Correspondents and Exchangers.—As we now publish Science-Gossip earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

To Anonymous Queriests.—We must adhere to our rule of not noticing queries which do not bear the writers' names.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply DISGUISED ADVERTISEMENTS, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges," which cannot be tolerated.

WE request that all exchanges may be signed with name (or initials) and full address at the end.

SPECIAL NOTE.—There is a tendency on the part of some exchangers to send more than one per month. We only allow this in the case of writers of papers.

TO OUR RECENT EXCHANGERS.—We are willing to be helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

DR. S. (Grimsby).—Enquire about the Lists of Diptera, of Mr. G. H. Verrall, Clerk of the Course, Newmarket.

C. J. P.—You cannot do better than procure Newman's "British Butterflies and Moths." It contains excellent woodcuts of each species. Messrs. W. H. Allen & Co., Waterloo Place.

EXCHANGES.

OFFERED, micro. slides, collection of 200 to 250, chiefly insect mounts. Wanted, polariscope and other objects, or offers.

ECHINODERMS.—Wanted, northern forms, as astronyx, goniaster, astropecten, luidia, amphidotus, &c.; also the stone-crab (*Lithodes*) and Norway lobster (*Nephrops*). Will exchange any specimens or micro. slides named in my lists.—Sinel, Biological Laboratory, Jersey.

QUADRANT tandem bicycle, No. 15, balls, dress-guards, and all accessories; also lady's bicycle, new, balls and all accessories. Wanted, microscope, camera, fret-saw, or offers.—W. Kirk, 20 Lombard Street, West Bromwich.

To Lepidopterists. Companion wanted for a visit to Digne (S. France), for alexanor, scipio, &c., in July next.—R. B. Postans, 14 Enys Road, Eastbourne.

WANTED, a small collection of mosses and micro. fungi, accurately named; two or three of each species if possible. Good slides given in exchange, or state requirements.—Philip Vancesmith, Illawarra, Bath.

WILL exchange about thirty-six birds' eggs (three red grouse, nightingale, partridge, &c.) for insects; elateridæ, *Cicada Anglica*, especially desired. Please write—C. J. Powell, 137 King's Road, Canton, Cardiff.

I CAN offer a few duplicates (Lond. Cat., 8th ed.) as follows: 189, 356, 620, 923, 1172*b*, 1315, 1441, 1669. Desiderata, 20, 86, 106, 243, 371, 492, 560, 604, 623, 900, 1431, 1574, 1597, 1704, 1763, 1841, and many others.—E. D. Bostock, Stone, Staffordshire.

WANTED, to exchange "The Naturalist," from August 1884 to December 1891, for "The Midland Naturalist," conchological books, or shells.—W. A. Gain, Tuxford, Newark.

EXOTIC butterflies. Brilliant wings of *Morpho Menelaus, Papilio Paris, Urania fulgens*, &c.; also fine cabinet specimens in great variety.—J. C. Hudson, Railway Terrace, Cross Lane, near Manchester.

WANTED, Beulley's "Manual of Botany," Foster's "Physiology Primer," Oliver's "Lessons on Elementary Botany," and Balfour's "Botany," in exchange for good specimens of British land and freshwater shells, correctly named and localized, or for young plants of some of the best varieties of the cactus tribe, and exotic greenhouse ferns.—M. A. O., 82 Abbey Street, Faversham, Kent.

WANTED, small British coleoptera; must be named. Will give micro. slides or material in exchange.—George T. Read, 87 Lordship Road, Stoke Newington, London, N.

VALATINE'S knife in good condition. What offers in exchange in micro. slides?—George T. Read, 87 Lordship Road, Stoke Newington, London, N.

WILL N. Lincoln botanists kindly favour me with records of cryptogamia (lichens, musci, and hepaticæ) for publication?—T. Larder, Mercer Row, Louth.

OFFERED, J. G. Wood's "Field Naturalist's Handbook" and "Common Moths," with coloured plates, &c. Wanted, any of Richard Jeffery's works, or what offers?—E. Hodder, 40 Wimborne Road, Nottingham.

FOR exchange, larvæ preserving-tubes, with instructions how to use; eggs of puffin, guillemot, black-headed gull, and others (send for list, free). Wanted, lepidoptera, entomological apparatus, or offers.—S. B. Chandley, Latchford, Warrington.

WANTED, Cornish or other minerals in exchange for Weardale spars and minerals.—T. V. Devey, Wolsingham, Darlington.

WANTED, SCIENCE-GOSSIP for 1872, bound or unbound; good exchange given in shells, fossils, &c.—John Hawell, M.A., Ingleby Greenhow Vicarage, Middlesbrough.

OFFERED, *Partula lignaria, P. Otaheitana, P. gibba, Goniobasis livensis, G. virginica, Paludastrina antipodum, Gibbulina palanga, G. sulcata, G. Newtoni*, and many others. Wanted, foreign helices. Exchange lists.—G. K. Gude, 5 Giesbach Road, Upper Holloway.

WHAT offers for "Val d'Arno," by Ruskin; Kohler's "Medicinal Pflanzen," folio, eighty-four coloured plates; "Journal of Botany" for 1890, 1891, bound half-calf, new, and various pamphlets and excerpts from scientific periodicals, containing papers on conchology? Wanted, books on conchology, and papers on foreign helices.—G. K. Gude, 5 Giesbach Road, Upper Holloway.

SCIENCE-GOSSIP from January 1883 to March 1885, inclusive, and February to September, 1891, inclusive. Will exchange anything useful or curious to a naturalist.—W. Balmbra, Warkworth, Northumberland.

CUCKOOS' eggs wanted, with those of their foster-parents. Many other varieties of eggs wanted. Rare eggs offered in exchange. Correspondence invited.—W. Wells Bladen, Stone, Staffs.

WILL exchange *Bulimus oblonga, B. zebra, B. exilis, Stenogyra octona, Achatina panthera*, for helices, bulimi, or marine shells not in collection.—J. Burman Rosevear, Roselea, 51 Crouch Hill, N.

WANTED, slides of selenite, and good polariscope objects. Offered, micro. slides, parts of insects, &c.—W. E. Green, 24 Triangle, Bristol.

OFFERED, *H. pomatia* (sinistral), *H. Bourcieri, H. morleti, H. lignaria, H. Iloronensis, H. Gaberti, H. Hombroni, H. Mackenzii, H. coma, H. inæqualis, H. Josephine, H. Lowii* (semi-fossil), *H. turricula, H. Michandi, H. laciniosa, Bulimus Ouveanus, B. scarabæus, B. fibratus, B. Dantzenbergiana, B. Mastersii, Chondropoma Poezi, C. crenulata, Czilomorpha flava*, &c. Offers solicited in other land shells.—Miss Linter, Arragon Close, Twickenham.

OFFERED, 100 mosses, named and localised; *Buxbaumia aphylla, Amblysdon dealbatus, Bryum Warnum, lacustre, Maerattii calophyllum, uliginosum, intermedium*, and *Catoscæpium migritum*, for micro. slides of animal matter.—G. Forbes, 7 Grahame Place, Dundee.

WANTED, works by Hewitson, Yarrel, Morris, or Seebohm. Offered, rare lepidoptera, Newman's "British Butterflies and Moths," vols. 14, 16, 17, and 24 of "The Entomologist," unbound and vols. 1 and 2 of the "Entomologist's Weekly Intelligencer."—C. C. Wood, 8 Barlow Terrace, Richmond Grove, Manchester.

SCIENCE-GOSSIP from commencement, 1865 to 1889, inclusive, bound and in excellent condition, for offers.—Edward Wright, 89 Shepherdess Walk.

EOCENE fossils, named and localized, also minerals and Cornish rocks. Will exchange for other minerals and rock specimens, terebratulæ from chalk (perfect), or offers.—E. H. C. Davies, 46 Upper Belgrave Road, Clifton, Bristol.

BOOKS, ETC., RECEIVED FOR NOTICE.

"Laboratory Practice," by Josiah Parsons Cooke (London: Kegan Paul, Trench, Trübner & Co.).—"The Oak," by H. Marshall Ward, M.A. (London: Kegan Paul, Trench, Trübner & Co.)—"Foods for the Fat," the scientific cure of corpulency, by Dr. Yorke Davies (London: Chatto & Windus, Piccadilly).—"On the Modification of Organisms," by David Syme (London: Kegan Paul, Trench & Co.).—"Catalogue of Zoological and Palæontological Books" (London: Dulau & Co.).—"Island Life," second and cheaper edition, by Dr. Alfred Russel Wallace (London: Macmillan & Co.).—"A Summer School of Art and Science," summer meeting, Edinburgh (vacation studies), sixth session, August 1–31, 1892 (University Hall, Edinburgh).—"The Conchologist," a quarterly journal for conchologists, edited by Walter E. Collinge (London: Swan Sonnenschein & Co.).—"Catalogue of Works on Natural History," part i. Zoology (offered by Bernard Quaritch).—"The Naturalist," a monthly journal of natural history for the North of England, edited by W. Denison Roebuck and Edgar R. Waite (London: Lovell Reeve & Co.).—"The Botanical Gazette," edited by J. M. Coulter, C. R. Barnes, and J. C. Arthur (Wisconsin: Tracy, Gibbs & Co.).—"Nature Notes," the Selbourne Society's Magazine (London: H. Sotheran & Co.).—"The Journal of Conchology," conducted by J. W. Taylor, F.L.S. (Leeds: Taylor Bros.).—"The American Monthly Microscopical Journal" (Washington: Chas. W. Smiley).—"The Victorian Naturalist," edited by A. H. S. Lucas (London: Dulau & Co.).—"Natural Science," a monthly review of scientific progress (London: Macmillan & Co.).—"The Irish Naturalist," No. 1, &c., &c.

COMMUNICATIONS RECEIVED UP TO THE 12TH ULT. FROM: W. E. G.—B. T.—J. A. R.—W. G. B.—W. H. N.—C. J. P.—D. B.—E. W.—F. A. F.—G. R. R.—W. B.—F. E. H.—W. W.—R. B. B.—J. S.—W. A. T.—P. V.—E. D. B.—C. L. L.—B. P.—J. H.—E. W. H. B.—W. B.—T. S.—E. W. W. B.—E. A. M.—W. W. B.—T. B. R.—W. E. G.—J. E. L.—G. P.—C. C. W.—S. B. C.—E. H.—J. L.—G. T. R.—M. A. A.—W. A. G.—H. E. S.—J. E. H.—H. E. G.—G. V.—W. J. N.—&c., &c.

IS OUR BRITISH CLIMATE CHANGING?

By J. E. TAYLOR.

THERE is no more certain fact revealed by geological science than that Great Britain has experienced all kinds of climate since life first appeared on the globe. This took place long before the appearance of Man. Climates have swung, perhaps alternately, from one extreme to another — from tropical heat to glacial cold, with all the variations between, known as temperate. The rocks of the British islands contain unquestioned evidences of this fact.

But these climatal changes have been exceedingly slow—not violent or cataclysmic. They have been largely due to external cosmical causes, as any reader will see who turns to the works of Dr. James Croll, "Climate and Time"; Dr. James Geikie's "Great Ice Age," or Sir Robert Ball's recent book on "The Cause of the Glacial Period." Such physical changes as were brought about by these almost imperceptibly slow astronomical aberrations and influences required periods of time, which neither traditional nor written history knows anything about. And to cause a distinct swing of the climate pendulum from the Eocene Period, when the London Clay was formed, to the Glacial Epoch, when the Boulder Clay accumulated, may have required a couple of millions of years at least, judging by the great physical geological changes which took place all over the world in the meantime.

Therefore, when we think of discussing the subject as to whether our English climate is altering or has altered within comparatively modern times, we must dismiss the direct geological or astronomical influences afore-mentioned. The question becomes narrowed almost to the "memory of the oldest inhabitant." Apart from the well-known and easily comprehended fact that even highly intelligent old people regard the period of their youth as distinctly superior in every respect to that they are privileged to spend their latter days in (every generation of elderly people has always done the same), the question remains as to whether, by any other causes than those directly geological or astronomical, the climate of this country has recently altered. Of course, when we compare the charms of the ordinary modern First of May (we had nothing to complain of this year) with the descriptions of the weather of that time in the older poets, we must remember that the Calendar has been altered since then, and that our First of May is twelve days earlier than it was in the days of Charles II., when Pepys wrote his Diary.

In a notable book published by the Hon. Mr. Marsh, then American Ambassador at Florence, twenty-five years ago, entitled "Physical Geography as influenced by Human Action," we have the only true key to the explanation of the rapid local changes of climate brought about within living but extended memories. Mr. Marsh showed how the cutting down of ancient forests to make clearings for emigrants and settlers "out West" affected the periodicity of the rainfall, the floods of the rivers, droughts, rainy seasons, etc. Woods and forests are the divinely-appointed "governors" of the climate of any country. I use the word "governors" not in any political sense, but in that employed by engineers, who understand thereby the "throttle valve," which regulates the force of steam admitted to work the machinery. All over the world, Mr. Marsh's views are now not only accepted but acted

upon. Many countries are re-planting or replacing wickedly-destroyed forests and woods. A tree is a sacred thing. No wonder it entered so largely into the mythology of our Norse ancestors. Time can make a tree, man cannot. Hence the cutting down of any tree ought not to be a matter of sport or pastime (*pace* Mr. Gladstone), but of thought and deliberation, for the absence of a living tree has by so much affected the atmosphere, even if it has been for only a few hundred feet radius. A landowner possessed of ancient trees is as much a responsible steward of them as if he owned rare ancient manuscripts. There is a higher authority than even ownership, and that is public opinion.

Modern scientific research is always springing new surprises upon us. One is now being much discussed within inner circles which may have an important bearing on the question as to whether our English climate is changing. Thus, Mr. Angus Rankin has pointed out that a new factor has been introduced into the study of modern meteorology—that which treats of the *dust particles* in the atmosphere, as well as the number present at any given time, and their effects on climate and weather changes. It would seem as if the study of *dust* and its behaviour would henceforth be the stepping-stone to the study of most of the meteorological problems which deal with clouds and precipitation, and solar and terrestrial radiation, as well as the diurnal and annual variation, in the temperature and pressure of the atmosphere. In the famous Ben Nevis Meteorological Observatory (founded and worked twelve years ago by my zealous friend Mr. Clement L. Wragge and his wife) now the most noted place of its kind in the whole world, Mr. John Aitkin's ingenious dust-counting apparatus is used for the purpose of constantly estimating and recording the number of dust-particles present in the atmosphere. One of the conclusions pointed out by Mr. Rankin as being arrived at thereby, is that when there is much wind there is little dust in the atmosphere, and when there is much dust there is little wind.

It will surely be evident to all intelligent people now that the presence of dust in the atmosphere affects its condition. Professor Lodge, nine years ago, at the British Association meeting held in Montreal, in his lecture on "Dust," showed that without the presence of dust in the air we should have no clouds. Perhaps we should have neither rain nor snow. Clouds are only microscopical drops of distilled moisture, condensed around millions of dust particles. Consequently, we see that the more dust particles there are thrown into the atmosphere (all other things being equal) the more clouds are likely to be formed. An increasing tendency to form clouds means drawing a screen across the sky to shut out both the sun's light and heat. Such a result must produce a colder series of seasons—a less vigorous and less meteorologically influential growth of vegetation. Clear skies exist where there is little dust, except that produced by nature's own effects, such as dust-storms, etc. It is where man congregates in his millions, erects his manufactories, unconsumes his smoke, pours uncountable millions of myriads of coal-dust and other particles into the atmosphere, that the blue sky and the bright warm sunshine get shut out and the weather locally *alters*, becomes chillier and more cheerless, until, among the toiling, underfed classes, *gin* takes the place of the *sun*.

Yes, physical geography is undoubtedly affected by human action even more injuriously than by the vastly slower changes ascribed to geology and astronomy. Perhaps (who knows?) even in this newly disturbed region of fog, rain, and cloud, due to increasing industries and ill-arranged furnaces, and the fearfully increased volumes of minute particles of unconsumed fuel thrown into the atmosphere, the very fact that coals have become dearer may have a redeeming effect. Manufacturers will not allow coals at 30*s*. per ton to be consumed as lavishly as they were at ten. The atmosphere will be the gainer. The sun will get a chance of breaking through artificially formed clouds, and every now and then of reminding us of the Old Testament saying that "it is a good thing for a man to look upon the sun!" Perhaps Professor Lodge's original scheme to disperse the atmospheric dust by discharges of electricity, given freely and generously to the world some years ago, but only recently practically and successfully tried in Boston Harbour, may come to our help, and assist us not only to forecast the weather, but help to *make* it! All things are possible to those who not only believe, but work and wait!

WORM-HUNTING IN SUSSEX.

By the Rev. Hilderic Friend, F.L.S., Author of "Flowers and Flower Lore," etc.

I WAS called away from home on business towards the end of March, and found myself afterwards in need of a little ruralizing. Being in town, I determined to run down to the south of England for a few days, and explore the country for worms. My tour proved a great success. Travelling from London to Hastings by the South-Eastern Railway I availed myself of the opportunity of alighting at Tunbridge Wells, for the purpose of examining the outskirts of the town. I found here more than one species of earth-worm which had not been recorded for Kent before, and had an opportunity of noting some peculiarities respecting the gregarious instincts of this class of animals. Reaching Sussex, I devoted my limited leisure to working the corner of the county which is enclosed by the Channel on the south, the railway from Robertsbridge to Hastings on the north, and a line drawn by the main road

from Robertsbridge to Hurstmonceux and Pevensey on the west.

Geologically speaking the conditions did not seem hopeful. Clayey soil abounds, and the little streamlets are red with iron held in solution, but no longer worked as of yore at Ashburnham Forge. I had examined portions of the same district on a former occasion with only moderate success, but a wider experience in the art of collecting had borne fruit, and suggested pastures new even for this branch of science. I commenced operations immediately on alighting from the train at Robertsbridge; and though I did not leave the high-road, I bagged several fine specimens belonging to the most interesting species indigenous to this country. The little square-tail (*Allurus tetrædrus*) was soon discovered in a ditch, well developed under its covering of damp, decaying leaves. This curious species is semi-aquatic, and must always be sought in damp places, such as the banks of streams, the edges of gutters or the margins of ponds. It frequently lies buried in the soft mud at a considerable depth, and uses its utmost endeavour to elude the collector's grasp by hurrying away tail first to a safe retreat. It is so earthy in its colour that it needs a practised eye to detect it in many cases. I found the same species in every part of the county visited, for it is quite a ubiquitous little creature. It is widely distributed on the Continent and elsewhere, as well as in Britain.

Other species found on the way to Dallington included the red worm (*Lumbricus rubellus*), the purple (*L. purpureus*), and the green (*Allo. chlorotica*). My next explorations were carried on in the pastures and woodlands at Dallington, a quiet little village half-a-dozen miles from Battle, and three miles north of the Earl of Ashburnham's picturesque domain. Here my labours were abundantly rewarded. I found the common earth-worm (*L. terrestris*), which, by the way, is not nearly as common as we generally suppose. What we have usually taken for this species is an aggregate group including two or three species, which have only recently been put through their facings and made to tell their story. One of these is the long worm (*Allo. longa*), with a dark sienna-brown body, sometimes approaching black, on which account the anglers have named it the black-head. This is far more frequently found in the different counties of England than the true earth-worm, and Sussex proved no exception to the rule. A good deal still remains to be done, however, in working out the species found in rich soil, especially such as is under high cultivation, and I solicit the favour of consignments of worms from my readers in order that I may determine the species and distribution of worms as yet unidentified as British.

Under the shelter of a pine forest I was able, though a keen wind prevailed, to startle some worms from their resting-place by shaking the soil with my fork, and to my surprise and joy among the rest I found specimens of the new worm (*L. rubescens*) which I have recently added to our lists. This worm being new to science, proved of special interest, both because I was able to form a better idea of its distribution, and also because it bore upon its ventral surface a number of spermatophores, which I had not formerly found on any true Lumbricus. March and April are months of special value for the worm collector because of the condition of the essential and accessory organs of the animals; and I was able on this account to make several notes of importance on various species in relation to this branch of natural history. I have now taken the ruddy-worm (*L. rubescens*) in Yorkshire (Idle, near Bradford) Middlesex (Hornsey), Kent (Tunbridge Wells), and Sussex (Dallington). It is about the size of the red worm (*L. rubellus*), but has the girdle on segments 34–39, whereas in the latter that organ covers 27–32.

Turning from the pasture-land to the adjoining wood, I hunted carefully for a dead tree lying on the ground. At last I found just what I wanted. In such habitats several very beautiful little worms abound which have hitherto been entirely unknown in England, though all the species at present found in this country are already on record for sundry continental districts. I have found that they really form a subgenus midway between Lumbricus and Allolobophora, and propose to revive the very accurate term Dendrobæna, introduced by Eisen twenty years ago, but allowed to fall into disuse, owing to the subject being insufficiently understood. To enter fully into a discussion of all the points of interest involved would here be impossible, and is the less necessary seeing that I have placed the whole subject before the Linnean Society. One new fact, however, has just come to light. In 1873 Eisen named a tree-haunting species *Allolobophora arborea*, failing to recognise that the worm truly belonged to his new genus Dendrobæna. This species is plentiful in the north of England, where I have taken it in very typical form. Hitherto it has, however, passed unobserved in Italy and other countries, so far as I can find; but another closely related species (*Allo. constricta*, Rosa), takes its place. Now in the South of England these two species meet and overlap. To what extent this occurs can only be proved by repeated investigation, but I am glad to be able now to place Rosa's worm on record for the first time as a British species. The distribution of some of these species is very instructive. The so-called *Lumbricus Eiseni*, Levinsen, is a case in point. It is one of the dendrobænic species with certain lumbricoid affinities, and has been found in Copenhagen, Carlisle, Glostershire, Sussex, and Italy. The true *Dendrobæna Boeckii*, Eisen has been repeatedly confused with the gilt-tail (*Allo. subrubicunda*, Eisen), and so a wide distribution has been assigned it. But while the gilt-tail is ubiquitous in Europe apparently, the other species is rare. I have found it only once, and

believe it to be a northern species, which dies out, or gives place in the south to other species. Another species (*A. celtica*, Rosa) was first found in Brittany. A couple of years ago I found it in Scotland, then in Glostershire and Lancashire, and now find it in my decaying tree-stump in Sussex.

A journey from Battle *viâ* Sedlescombe to St. Leonards yielded the red, purple, green, and turgid worms, and the little square-tail. Others might have been found, but the wind was so intensely cold that it was with difficulty I could carry out my pursuits. My explorations ended with a tramp from Pevensey to Hurstmonceux on the 30th. The square-tail was plentiful in ditches down to sea-level, the brandling was found in old manure-heaps, and inside the castle-grounds I found the green and purple worms. To these during the day I added the mucous worm (*Allo. mucosa*, Eisen), the typical common earthworm (*L. terrestris*, L.), and the long worm, while a rich harvest was gleaned among the fresh-water and allied species. I regret to say that most of the latter were devoured by leeches before I reached my home in Yorkshire so that I shall have to replace them before I can give a complete list of captures on the strength of living materials. The following list will perhaps be serviceable to future workers. There are almost certain to be two or three other continental species in Sussex yet unrecorded, and I shall be grateful to any collector either in the south or elsewhere who will send me living specimens from different parts of the kingdom. Much yet remains to be done in Scotland, Ireland, and Wales, as well as the Shetland, Orkney, and Channel Islands. Worms should be placed in tin boxes with soft moss, and addressed 4, The Grove, Idle, Bradford.

LIST OF KNOWN SUSSEX EARTH-WORMS.

1. *Lumbricus* .	*terrestris* (Linn.) .	1
	rubellus (Hoffm.) .	2
	rubescens (Friend) .	3
	purpureus (Eisen) .	4
2. *Allolobophora*	*longa* (Ude) . . .	5
	turgida (Eisen) . .	6
	chlorotica (Sav.) .	7
	mucosa (Eisen) . .	8
	fœtida (Sav.). . .	9
3. *Dendrobæna*.	*subrubicunda* (Eisen)	10
	Eiseni (Levinsen) .	11
	celtica (Rosa) . .	12
	arborea (Eisen) . .	13
	constricta (Rosa). .	14
4. *Allurus* . .	*tetrædrus* (Sav.) . .	15

SOME STALKED ACTINOPHRYANS.

IT has been my good fortune during the past three months to discover two rare Actinophryan Rhizopods in the waters of one of our Calcutta tanks. In November last I found *Clathrulina elegans*, and in January last *Hedriocystis pellucida*. In a paper on Clathrulina, which was read before the Microscopical Society here on the 14th December last by its President, Mr. Wood Mason, he said: "This remarkable genus of the order Heliozoa, in the lower grade (Gymnomyxa) of the Protozoa, was first introduced to the notice of zoologists in 1867 by the Russian naturalist Professor L. Cienkowski, of Odessa, who,

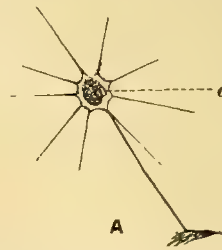

Fig. 72.—*Hedriocystis pellucida*. (A), as seen under a $\frac{1}{6}$-in. Economic.

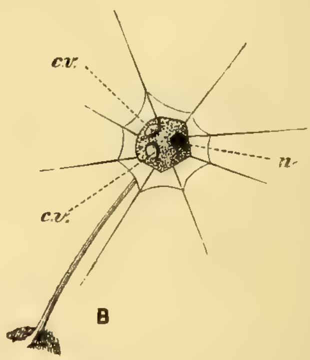

Fig. 73.—*H. pellucida*. (B), an average specimen.

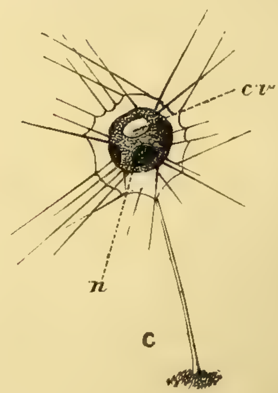

Fig. 74.—*H. pellucida*. (C), the organism with numerous protoplasmic threadlets.

in a paper remarkable for the numerous valuable observations that it contains, fully described it, with two of its three methods of multiplication, under the name of *Clathrulina elegans*. Cienkowski found it first at St. Petersburg, and afterwards at Dresden and Franzensbad in Germany, in fresh-water ponds, attached singly or in bunches to various aquatic

plants. In the same year, apparently at a somewhat earlier date, it was discovered in Ireland, and described under the name of *Podosphæra Haeckeliana*, by the British naturalist W. Archer, who subsequently recognised it as the *C. elegans* of Cienkowski. Later on it was met with, and carefully studied, by Clathrulina belongs. Finally it was found in New Jersey and in Pennsylvania, in North America, and figured with diagrammatic clearness by the American naturalist, Dr. Joseph Leidy. In 1879, a second species of Clathrulina was described by C. von Mereschkowski, and named *C. Cienkowski*, after the

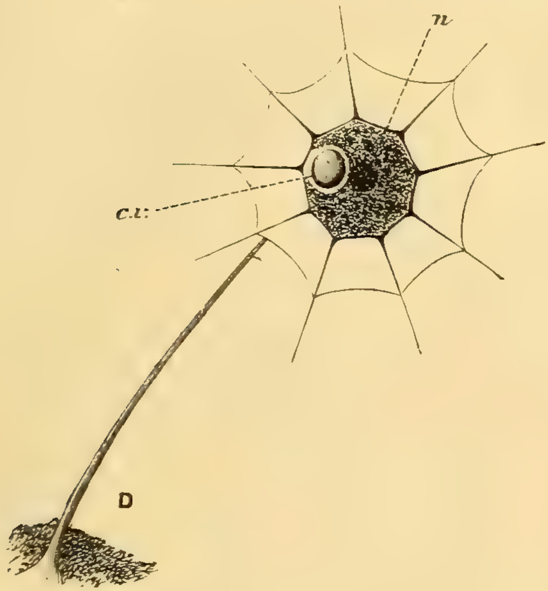

Fig. 75.—(D), a finely-developed, but not unusual form of *H. pellucida.*

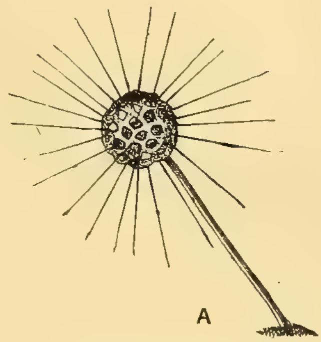

Fig 76.—*Clathrulina elegans.* (A), as viewed with a one-sixth objective.

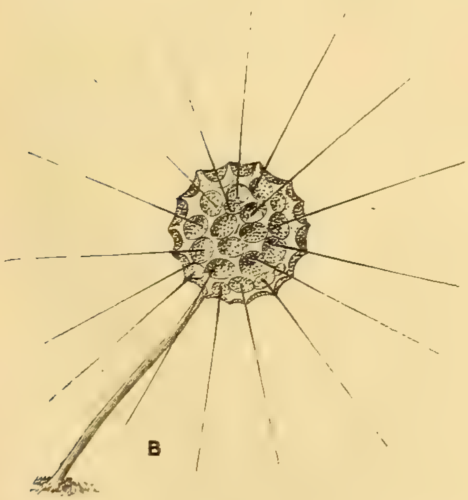

Fig. 77.—*C. elegans.* (B), a dark and probably old specimen.

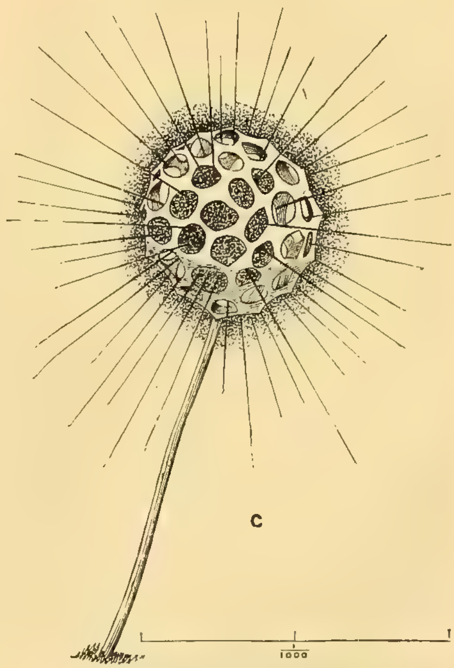

Fig. 78.—*C. elegans.* (C), an active organism with a protoplasmic veil and numerous threadlets.

Professor Haeckel at Jena, Professor R. Greef, and Professors Hertwig and Lesser at Bonn, all of whom have published valuable observations upon it, and upon its relations to other Protozoa, especially the three last named, whose papers are most valuable contributions to our knowledge of the group to which original discoverer and describer of the genus. This truly beautiful and elegant species, which was found in the Lake of Onega, near Powenetz, is readily distinguishable from its congener by its spiny shell, which gives off from the small triangular area between every three of its holes a short, blunt, and

erect cylindrical spine, every hole being consequently surrounded by a circlet of six spines; by the perfect regularity of the lattice-work of its shell; and by its comparatively thick and unbranched pseudopodia. The little-known *Hedriocystis pellucida* of Hertwig forms in all probability a third species of the same genus. The class Heliozoa has been divided into four orders: Aphrothoraca, Chlamydophora, Chalarothoraca, and Desmothoraca, to the last of which Clathrulina belongs. . . . *C. elegans* is here for the first time recorded from the continent of Asia."

My sketches which illustrate this paper will sufficiently show the main features of Clathrulina. It is a delicate unicellular organism allied to the sun animalcule, but is enclosed in a siliceous sphere; in my experience the carapace is not always absolutely spherical. The organism bears a close resemblance to the marine Radiolaria. In young specimens the sphere is hyaline; in the older specimens it is a yellowish brown. Unlike *Actinophrys sol*, the sarcode body of Clathrulina is irregular in form. It has a nucleus,

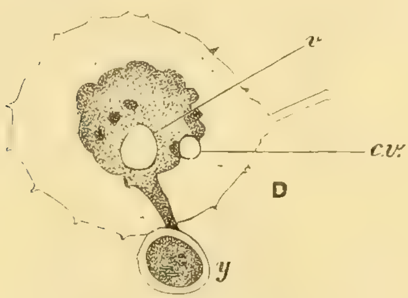

Fig. 79.—*C. elegans.* (D), Protoplasmic contents undergoing encystment at *y*; all threadlets withdrawn.

contractile vesicles, and food vacuoles. The pseudopodia, which are of great tenuity, radiate as in Figs. 76, 77, 78, A, B, and C, through the latticed openings of the shell in all directions. In an active specimen, like C, the protoplasmic body appears to invest the sphere with a delicate veil, beyond which the ordinary pseudopodia extend. Assimilation of food particles has been observed to be occasionally performed outside the siliceous capsule, by an afflux of protoplasm to the pseudopodia on the side where the particle may be arrested; but as a rule the observations show that this function is carried on within the sphere. Specimens are frequently met with in which, as in E (Fig. 80), the sarcode body is retracted on all sides into the capsule. Reproduction is carried on in three ways: (1) By fission into two parts, which on quitting the shell, put forth pseudopodia, develop a stem, and finally silicify the protoplasmic foundations of the capsule and stem, siliceous salts being apparently taken up by the organism, and deposited on the exoplasm; (2) By fission into several parts, which instead of quitting the shell as amœbulæ, become encysted; after the winter's rest, each cyst develops a free-swimming zoospore, furnished with two flagella, which is ultimately transformed, as mentioned under the succeeding head, into the perfect organism; (3) By fission into three parts, one of which again subdivides into two; these latter force their way through the lattice-work of the capsule, swim about as free flagellulæ for a short time, and thereafter fix themselves, take on a globular form, develop pseudopodia, and later on a siliceous capsule and stem, the sarcode being ultimately withdrawn into the body-substance of the core. The second and third methods are obviously best suited to secure dispersal of the species. I am indebted for these particulars to Mr. Wood Mason's paper already referred to, and which has been mainly drawn up from the memoirs of Cienkowski, Greef, and Hertwig and Lesser, and from Bütschli's account of the Heliozoa. In Fig. 79, D I have represented what I believe to

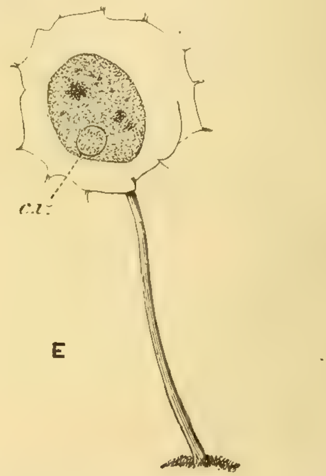

Fig. 80.—*C. elegans.* (E), protoplasm retracted. In this and the preceding figure the objective is focussed on the protoplasmic core of the organism, and the carapace is seen in outline, the lattice-work not being in focus.

have been a reproductive process in course of progress, in one of the specimens secured by me. The pseudopodia were withdrawn on all sides, while a portion of the protoplasmic contents were protruded in a dense stream, the further extremity of which seemed to be encysting itself outside the capsule at *y*. A large vacuole had formed near the point of origin of the stream, and the contractile vesicle was in vigorous action. I could not detect the nucleus, though there were four or five small patches of condensed granular matter in the body of the specimen.

The water in which I found my specimens had been drawn from the General's Tank quite a month previous to my discovery. The Clathrulinas were attached to decaying portions of Anacharis and Vallisneria, and were also mixed up with the débris at the bottom of the glass bowl containing the weeds. In all my sketches I have shortened the stems, which in length are from six to seven times the diameter of the capsule. The scale appended to the sketches

which illustrate the species found by me, applies only to figs. 78 and 80, C and E.

Later on, in the course of our cold season I obtained in the same glass bowls and water, numerous specimens of "the little-known *Hedriocystis pellucida* of Hertwig." Four sketches of this rare organism accompany: A (Fig. 72) was drawn under a $\frac{1}{8}$-inch Economic objective; B, C, and D (Figs. 73, 74, 75) under a $\frac{1}{16}$-inch w. i. of Seibert; D being projected at about double the normal distance in order to get clear details of a well developed, favourably placed specimen. In B (Fig. 73) we have an average Hedriocystis, while in C (Fig. 74) there is an abnormally irregular and abundant development of pseudopodial threadlets. The scale which accompanies these sketches applies only to B and C (Figs, 73, 74). Mr. Wood-Mason has kindly let me have the following note descriptive of this organism: "Stalked shell, round to oval, perforated by numerous holes drawn out into pointed bases; small (0·02 to 0·03 mm.): protoplasmic body only partially fills the shell, with a central nucleus, and several contractile vacuoles in its peripheral parts. Pseudopodia not branched, and not anastomozed. Multiplies by simple fission; encystment observed. Stalk 0·05 to 0·075 mm. long; lower end broadened for attachment; upper passes without sharp boundary into contours of shell." It will be noticed that this description does not quite correspond to my sketches; e.g. the stalk in my illustrations seems to be cut off by the sharp contour of the lower part of the "shell." This may be explained by my having sketched organisms in which the stalk merged into the "shell" behind the plane under observation. In two specimens killed with osmic acid solution the stalk was distinctly seen to pass without a sharp boundary into the "shell." Then, again, as regards the "shell," I will not say it is, but it looks very like a delicate membrane; and this leads me to enquire whether or not Hedriocystis may be a stage in the development of Glathrulina? I am bound to add that I have not been able to detect any silicifying process, or any approach to the formation of the lattice-work, which is so conspicuous a feature in Clathrulina; but while I frequently meet with the empty carapaces of Clathrulina in the débris at the bottom of my bowls I have not yet found the empty "shells" of Hedriocystis, though I have looked for them. One noteworthy circumstance in connection with the two stalked Actinophryans described above is that they were both obtained after the water had been drawn from the General's Tank for some weeks; the loss by evaporation having been meanwhile kept up by occasional additions of pure water, while the supply of oxygen was maintained by the weeds in the bowl: when first drawn neither Clathrulina nor Hedriocystis was detected. So far as I am aware, this is also the first record of the discovery in this country of Hertwig's Hedriocystis.

Calcutta. W. J. SIMMONS.

ON THE SCHEMATISM OF SHELLS IN MOLLUSCA GLOSSOPHORA.

THE shells of Glossophora exhibit a wide variety of forms, but are as a rule merely variations on the simple spiral. Now, since in these days we are not accustomed to consider variations at mere "freaks of nature," but try to elicit their meaning and bearing on past history (on the hypothesis that "nature" is not given to making meaningless freaks for the fun of it), it seems rather strange that we so seldom hear of any attempt to elicit evolutionary facts from the shapes of the shells which we study. I should like therefore to suggest the following series of hypotheses to the attention of conchologists. (I.) That the earliest form of shell was probably a bilaterally symmetrical cone. Of this there seems little doubt: but subsequently, as it seems to me, the shell became tapering and cylindrical, and next (II.) became incurved, probably from reasons of mechanical convenience, which it is easy to imagine. Something of this sort is to be observed in certain existing shells (by "reminiscence" probably) and the geologists will be able to give us instances from the Cephalopoda. (III.) Next comes the flat-coiled spiral, of which, instances from the Cephalopoda of past ages are numerous, and we see the same kind of thing to-day in a typical Planorbis, e.g. *P. spirorbis*. (IV.) After this stage we find the peristome placed a little sideways (cf. *Planorbis corneus*), which arrangement, as well as the other steps to a certain extent, I think I could demonstrate to be due to reasons of anatomical convenience. Here usually we find the principle of carination most evident, *i.e.* in the majority of forms: it seems to be due to compression, and to be the same thing in principle as babylonism. (V.) Next we come to the forms in which the spire begins to be more prominent, either, as in our three common Helices, by the enlargement of the last whorl (possibly a sort of reversion), or by depression of the peristome below the preceding whorl, as in *Bythinia Leachii* or *Limnæa truncatula*; the beginnings of which process in these cases are suggested by *Valvata piscinalis* and *Planorbis dilatatus* * respectively. Eventually either the last whorl predominates, as in extreme *L. auricularia*, or the spire, as in Turritella and many others.

Of course this is not intended in any sense as a classification; indeed, a certain amount of experience has taught me to regard as artificial any too regularly formulated scheme of arrangement. But the above suggestions may be of service to those who are investigating the phylogeny of any group of mollusca. For instance, the valvatiform young of *Paludina vivipara* would be perfectly intelligible to one who regarded as probable the precedence given to flat uncompressed spirals in the above "fistular

* But better by some other foreign Planorbes.

theory," if I may call it so. I have collected a large number of facts relative to Glossophora—more especially Palæarctic land and freshwater species and varieties—which seem to me to be well explained thereby, but it will be better to produce these after I have heard the criticisms of other conchologists.

As I have mentioned varieties, I may as well add that the occurrence or non-occurrence of certain forms as varieties, has a most important, and I think confirmatory, bearing on the above hypotheses. The colours of shells also help us considerably; and by comparing a series arranged primarily according to shape (with deductions, of course, for obvious reversions) and consisting of various British and foreign Valvatidæ and Paludinidæ,* I arrive at a sequence of colours, which agrees in a wonderful way with one of the colour sequences noticed in insects, for which see Mr. Tutt's "British Noctuæ and their Varieties," vol. ii. Introduction, especially p. vi; also the papers on "Melanism and Melanochroism," (by the same author), afford some interesting parallels (to the genus Melania especially). On the whole, I should think that there are more variations of colour-sequence than he mentions, but the agreement in this particular case is satisfactory.

E. W. W. BOWELL.

* Is there any sufficient reason for dividing these two families? I can find nothing very cogent in the anatomy, and think on the whole they should be ranged together.

SOME FAMOUS COLLECTING-GROUNDS FOR DRAGON-FLIES.

By the Author of "An Illustrated Handbook of British Dragon-flies," "A Label List of British Dragon-flies," etc., etc.

IV.—THE LAKES OF KILLARNEY.

THE Lakes of Killarney are without doubt the most beautiful and attractive district in the Emerald Isle. Every natural beauty that can please the eye exists here in rich profusion. Nature is everywhere in various garbs of beauty, awfully impressive and awe-inspiring; as, for instance, in the gloomy Black Valley stretching away among the fastnesses of the majestic MacGillicuddy's Reeks, the noisy streams from their rugged sides but intensifying the solitude—"A valley secluded as the heart of the sternest recluse could desire, where ever-brooding melancholy reigns;" or the Gap of Dunloe—that wild, lonely, magnificent defile, lying between the Reeks and the Toomies, four miles long, in which the lofty mountains, apparently rent asunder by some strange convulsions of nature, overhang the pathway, fearfully casting their gloomy shadows on the murmuring stream below; or the picturesque romantic loneliness of Glena Bay—"the Bay of Good Fortune;" the shores and the lofty Glena Mountain, which are covered with a luxuriant growth of trees—the oak, ash, pine, hazel, etc.; with that never-failing accompaniment of Killarney scenery—the arbutus.

The celebrated lakes are of course the chief centre of attraction to the enthusiastic dragon-fly hunter in this delightful domain, and well indeed will a careful search after these winged treasures repay him for the trouble. Nearly all the kinds of dragon-flies which occur in Ireland may be found here, a complete list of the different species indigenous to the Emerald Isle being as follows:—*Platetrum depressum* (not uncommon), *Lepletrum quadrimaculata* (common), *Sympetrum vulgatum* (ditto), *S. Scoticum* (very plentiful), *Cordulia ænea* (this elegant insect has not for certain been captured in Ireland, but is believed to occur there), *Gomphus vulgatissimus* (there is some doubt also respecting the occurrence of this pretty species in the Emerald Isle), *Condulegaster annulatus* (common, particularly among the mountain streams, for which it seems to possess a special predilection), *Brachytron pratense* (very local, but generally common whenever it occurs), *Æschna juncea* (common, particularly in the north of Ireland) *Æscyanea* (chiefly occurs in the south of the island), *Æ. grandis* (not rare, but local), *Calopteryx virgo* and *C. splendens* (very plentiful everywhere), *Lestes nympha* (rare and very local), *L. sponsa* (common, but local), *L. barbara* (no example of this species has ever been known to have been captured in Ireland, but it is included in the British list on the strength of a single specimen in the Dublin University Museum. If it occurs in the Emerald Isle at all, the district of Killarney would probably be the most likely place for it). *Enallagma cyathigerum* (plentiful) *Agrion pulchellum* (local), *A. puella* (exceedingly abundant everywhere), *Ischnura elegans* (very common), *Pyrrhosoma minium* (very plentiful everywhere), and *Erythromma najas* (very local and rare).

In addition to the district of Killarney there are many other good hunting-grounds for dragon-flies in the Emerald Isle which would well repay a visit; this country, however, has hitherto been so sadly neglected by entomologists, that it is uncertain what "good species" may be made to turn up after a little diligent research and investigation. The district in the extreme south-east of the island ought to be productive of many good species of dragon-flies, from whence indeed, I have received *Brachytron pratense*, *Sympetrum vulgatum*, *Scoticum*, and *Lepetrum quadrimaculata*, in addition to many other sorts from correspondents at various times.

THE "Book-Lovers' Leaflet" is always the firs thing we select for perusal each month. The "Easter Number" is as good as a holiday, and much cheaper. (London: Pickering and Chatto: 66 Haymarket).

ROSSENDALE RHIZOPODS.

No. 9.

My previous papers on the above subject, have chiefly been written with a view to assist the young student in the identification of his finds; but they have the additional value of furnishing a record of the species found in a locality, which, so far as I am aware, has been previously unworked. In order to make this record as valuable as possible, I append a complete list of my captures, many of which have been discovered either during the time my former articles were going through the press, or since.

PROTOPLASTA LOBOSA.

Amœba proteus	Hyalosphenia tincta (rare)
A. verrucosa	H. papilio (rare)
A. radiosa	Nebela collaris
A. villosa	N. flabellulum
Pelomyxa villosa	
	Arcella vulgaris
Difflugia pyriformis	A. discoides
D. urceolata (rare)	A. mitrata (rare)
D. acuminata	
D. globulosa	Centropyxis aculeata
D. constricta	C. ecornis
D. spiralis	

Total 20

PROTOPLASTA FILOSA.

Pamphagus hyalinus	Euglypha alveolata
Pseudodifflugia gracilis	E. ciliata
	Trinema acinus
Cyphoderia ampulla	

Total 6

PROTOPLASTA HELIOZOA.

Actinophrys sol	Diplophrys Archeri
Actinosphærium Eichhornii	Vampyrella laterita
Acanthocystis sp. (with simple spines)	Hyalolampe fenestrella
Clathrulina elegans	Heterophrys myriopoda

Total 8

New species	7
Protoplasta lobosa	20
P. filosa	6
P. heliozoa	8
Total	41

In the above list it will be noticed that there are twenty species of *Protoplasta lobosa*, six species of *Protoplasta filosa*, and eight species of the *Heliozoa*. The *Protoplasta lobosa* are very common in our ponds, ditches, small reservoirs and wells, with the exception of the two species of Hyalosphenia, which are exclusively of sphagnous habitat, and are, as far as my experience goes, exceedingly rare. As will have been noticed from my papers, all, or nearly all, the testaceous forms of the lobose Rhizopods, even of the same species, are very variable, not only in size, and to a less extent in form, but also in the character and distribution of the various elements which go to make up their tests. All the filose Rhizopods I have enumerated are fairly plentiful, but have been found only in the clearest pools and wells. The Heliozoans, with the one exception of *Actinophrys sol*, are exceedingly rare, one or two specimens only, of each species recorded, having as yet rewarded my search. This may perhaps be accounted for by the sparseness of our floating vegetation. We have three of the four species of Lemna (minor, major, and trisulca), but these are only found in a very few of our waters, and as far as I am aware are the only floating pond-weeds found in Rossendale. Possibly, as the Rhizopods of this order are more or less surface-forms, or at least swimmers, the excessive rain-fall of the past year may have had the effect of thinning their numbers. From the frequency of their appearance in tubes of the Rotifera, sent me by numerous correspondents, I should imagine that the Heliozoa are more plentiful in the south of England, than in our cold, bleak northern district. In addition to the above, I have discovered seven new species, all testaceous, making forty-one species altogether, but as these were unfortunately represented only by empty tests, I regret that I shall have to defer a detailed description of them until a further study has supplied this important deficiency. Several correspondents in the vicinity of London have sent me drawings of other forms, not described in "Leidy," and I feel convinced that if microscopists in various parts of the country were to take up the systematic study of the Rhizopods, science would soon be enriched by the acquisition of numerous new species, in a class which, so far as the fresh-water forms are concerned, appears to me only meagrely represented, by about seventy species. The classification of the order Heliozoa, is, perhaps, as good a one as could possibly be contrived under present circumstances, but it soon becomes evident to any one who has studied this order, and who has had a fair number of forms under observation, that many of his specimens cannot be made to fit into any of the genera of Professor Leidy; and there have not been wanting indications that some of the obscurer forms of the order present themselves at different times, under widely different aspects. Even the authority named himself has been content in many cases to indicate only the genus to which some of these puzzling forms apparently belonged. This change of aspect has especially characterised some specimens (presumably of Heterophrys) kindly sent me by Mr. Scourfield, from the Victoria regia tank, Regent's Park. I hope subsequently to be in a position to refer to this matter again when further study has made me acquainted with additional facts in the life-history of this interesting order. I have hitherto said nothing as to the reproduction of the class; indeed, in this early stage of my enquiry, all my energies have been directed to the discovery and determination of the various species occurring in the district; and although some phases of the reproductive process have been witnessed, yet these have been of a too fragmentary character to prove of much value until supplemented by further research. In addition to the discovery of new forms, and the elucidation of the modes of development, there is, it appears to me, a wide and interesting field of enquiry in relation to the

formation of the tests of the Rhizopods. What a variety of elements are utilised in their formation! Mud, minute, rounded sand-grains; comparatively large, angular blocks of sand; linear, fusiform, and oval Diatom frustules; round, oval, and rod-like plates of silica; chitine, either as a simple and homogeneous, variously-formed box; plain, hexagonally pitted, spinous or hairy; or in the form of square, oval, hexagonal or vermiform plates. These elements are used singly or variously combined, frequently exhibiting a charming arrangement, which much increases the interest with which we view these humble Protozoa. What a number of problems crowd upon the mind and demand solution, as we contemplate the intricate structure of the Rhizopodian test! How are the extraneous matters collected and built up? How are the intrinsic elements secreted and placed in position? Do these "shells," increase in size? Are they formed only during the hours of darkness? I cannot answer these questions, nor many others which will readily suggest themselves to the thoughtful mind; nor am I aware that any answer has been given, but they are surely not unanswerable. If this is the case, then here is work awaiting those who burn to distinguish themselves, to help on the march of Science, and to have their names inscribed in its annals. I hope some of our younger men may be induced to take up the study of this lowly, but interesting class of the animal kingdom. My next article, which will be the last of the series, will deal with "The collection and examination of the Rhizopods."

J. E. LORD.

Rawtenstall.

A BOTANIST'S HOLIDAY IN THE PYRENEES.

HAVING made up my mind to take my holidays among the Pyrenees, in July 1888 I took passage by the good steamship *Cotopaxi*, bound from Liverpool to Bordeaux on her way to South America. Leaving Liverpool on a cold, drizzling afternoon, we steamed away for the sunny south. Next morning we passed Land's End, and bid farewell to the shores of Old England, which probably many of those on board would look upon no more. The same evening we passed by the rocky coast of Brittany, and entered the celebrated Bay of Biscay. The Fates being on this occasion propitious, we were not troubled with the horrors of sea-sickness, in fact this proved the smoothest part of the passage, and at 3 p.m. on the afternoon of the third day we were steaming slowly up the noble river Garonne, past vineyards, (strange sight to English eyes) and quaint villages among tall poplars, till at last we came to a halt at the small village of Pauillac, where the passengers for Bordeaux are transferred to the tender, which takes them up to the great French seaport. About 9 p.m. we came in sight of the lights of the city extending far along the river-bank, and shortly afterwards landed amidst a host of land-sharks, and after being half torn to pieces, we gathered our remains, and made for our several quarters.

Next morning I set out to view the city, a very interesting one, with its old cathedral (built by the English during their possession of the place, and where our Richard II. was christened), with its fine old churches, and Roman amphitheatre called the Palais Gallien.

In the evening I strolled away across the magnificent stone bridge over the Garonne, to the suburb of La Bastide, and continuing along the Avenue Thiers, till a bit of country was reached, I had a foretaste of good things to come. *Sambucus ebulus*, and *Eryngium campestre* were common along the road-sides, and in a ditch I found *Azolla Caroliniania* in abundance; farther on was *Centaurea calcitrapa* with its pink spiny heads, and *Myagrum perfoliatum* with its curious top-shaped pods. As the evening closed in it became too dark to see more, and so I returned to Bordeaux, and took the midnight train from the St. Jean station for the happy hunting-grounds of the Pyrenees. It is 169 miles from Bordeaux to Laruns, a terminus in the department of the Basses-Pyrénées, and to accomplish this distance we took ten hours by direct train to Pau, and thence, after an hour's waiting, the remaining twenty-four miles to Laruns.

After breakfast at the comfortable and good hotel near the station (Hôtel de l'Europe, I think), I set out for a day's hunting in a valley running up from the main valley, and leading to the Col d'Aubisque (5610 feet). The first finds were Sedums (or Seda perhaps more correctly), *Sedum micranthum* (Bast.), *S. dasyphyllum* (L.), and *S. rubens* (L.), *Campanula patula* was common by the road-sides and in fact all through the Pyrenees; *Campanula rapunculoides*, and *C. glomerata* also were not uncommon. *Lamium maculatum*, var. *hirsutum*, a hispid variety with green leaves was observed in the hedge bottoms. The rusty-back fern (*Ceterach officinarum*) occurred here and there on walls. Farther up the valley, the lower parts of which are densely clothed with oak and beech, I came on *Stachys recta* (L.), a yellow-flowered species; *Carduus medius* (Gouan), like a small *C. nutans*; *Hypericum Burseri* (Sp.), a very glandular, large-flowered species, in habit like our *H. montanum*; *Prunella grandiflora* (Mönch), a fine large-flowered species; and *Dianthus monspessulanus* (L.), var. *Walsteinii* (Sternb.). The underwood consists almost entirely of box (*Buxus sempervirens*), and the heath of this part is *Erica vagans* (L.). Crossing the valley, I came across *Trifolium ochroleucum* (L.); *Teucrium pyrenaicum* (L.), a beautiful little creeping plant, with yellow and purple flowers in dense heads, and roundish leaves, very common in this valley, though I never happened to meet with it again; and

Anthyllis vulneraria, var, *rubriflora* (DC.); *Dillenii* (Schultz), also very common here. A peculiar form or variety of *Malva moschata*, with crenate and reniform leaves [var. *Ramondiana* (G. G.)], was noticed here. *Echium vulgare*, var. *pyrenaicum*, grows in great profusion all about. Returning in the cool of the evening through one of the quaint old stone-built villages, I encountered the female portion of the community, all busily engaged at Blind Man's Buff, and having to pass through the midst was made prisoner by the Blind Man (or Woman) amidst shouts of laughter from the other players. The look of dismay on the woman's countenance, on discovering whom she had captured, was worthy of being photographed. However, I was not obliged to serve, and was allowed to pass on my way without further molestation.

Next morning, the weather continuing all that could be wished, I set out for the Pic du Midi d'Ossau, about ten miles farther up the Val d'Ossau. The way from Laruns to Eaux Chaudes commences in a splendid cutting between overhanging mountains, with a torrent foaming along some hundreds of feet beneath, the old road, now disused for wheel traffic, being on the opposite side of the valley about 300 feet or so higher up, but looking almost directly down on the new road. In one place the old road passes through a tunnel in the rock. Three miles up the valley lies the watering-place or Spa of Eaux Chaudes, a small but fashionable resort. On the way I found *Bupleurum falcatum*; *Hypericum nummularium* (L.), a very pretty trailing species; *Betonica alopecuros* (L.) a large yellow-flowered plant; *Adiantum capillus-Veneris*, on damp rocks; and *Ononis natrix*, a species with large yellow flowers, beautifully marked with reddish veins. Eight miles past Eaux Chaudes is the poor hamlet of Gabas, the last village in France on this route; here the carriage-road ends, but a good horse and mule track goes on over into Spain. The village contains a curious old church, dated (if I remember rightly) 1120; it has four slits for windows about 4 feet by 1 foot. Past Gabas, in a small wood by the stream (whither I adjourned for the mid-day repast), I found *Veronica ponæ* (Gou.), something like our *V. montana*, only the flowers are larger and in a loose terminal raceme; *Crepis lampsanoides* (Froel.), a tall leafy species, like a large hirsute *C. paludosa*; *Thalictrum aquilegifolium*; *Meconopsis cambrica*; *Lilium Martagon*; *Erucastrum obtusangulum* (Reich), *Adenostyles albifrons* (DC.), like a cordate-leaved Eupatorium; *Hypericum Burseri* (Spach); *Polygonatum verticillatum* (All.), in fruit *Galium rotundifolium* and *Ranunculus nemorosus*. Higher up the valley, at about 4000 ft., the Saxifrages began to be common. *S. Geum*, *S. hirsuta*, *S. aizoon* (Jacq.), all on rocks by the road-side. On a stony bank I found *Carlina acaulis* (L.), and var. *subacaulis* (DC.), large-headed Carlinas with white, silvery inner bracts; and *Carlina cynara* (Pourr.), with yellow inner bracts, and very large acaulescent heads. *Linaria alpina*, with its beautiful purple and orange flowers, and glaucous foliage, now began to appear, showing the higher altitude, also *Erinus alpinus*, with its bright rose-purple flowers. *Eryngium Bourgati* (Gou.), a blue-flowered Pyrenean species, with an almost simple stem, about a foot high, was common on the grassy slopes, together with *Merendera bulbocodium* (Ram.), a lovely rose-flowered colchicum-like plant, this latter in places so thick that it coloured the slopes that it grew on. I had good reason to remember this plant, for, in digging up some of its corms, I broke my good root-knife, and was unable to replace it for nearly a week, when I got a formidable-looking vine-dresser's knife instead. Suddenly, on turning a corner in the road, there burst upon the astonished sight the view of one of, if not *the* most picturesque peaks in the Pyrenees, the Pic du Midi d'Ossau; round the base and some way up the rocky sides were dark pines, then towering away above for about 3000 feet is a precipitous, pinnacled mass of bare rock. The sight viewed from this point is simply magnificent, and in my experience is only equalled by the Matterhorn. The weather up to this point had been beautifully clear, but lower down the valley I had noticed a few light fleecy clouds blowing up; presently some arrived in the part where I was, and in ten minutes the crags of the giant mountain had disappeared, and the whole valley was filled with a cold mist. As it was getting late and the fog prevented farther progress, I set out to return, and on the way, on some inaccessible rocks above the road, I saw some splendid specimens of *Valeriana pyrenaica*, about 6 ft. high, and some *Ranunculus platanifolius* (L.), a large, white-flowered species. Having carefully looked over the rocks, and finding no way of ascending, not to be done I fastened a sharp penknife on a long tree-branch, and soon fetched them tumbling down. A little way on again *Arabis alpina* appeared, and last but not least, *Aquilegia pyrenaica* (DC.), a lovely plant, more slender than *A. vulgaris*, with flowers as large or larger, of a pure light blue, stems simple, 8 in. to 1 ft. in height. This was the last find for the day, and a few hours' walk brought me back to the hotel at Laruns. Next morning was cloudy, but fine, and bidding farewell to Laruns, I set out to walk by the Route Thermale, a splendid road made by Napoleon III. to connect the watering-places in the Val d'Ossau with those in the Argelès valley, and save the long détour by Pau and Lourdes. After passing the watering-place of Eaux Bonnes, the road passes up the valley to the end, and then mounts up by long zigzags through a pine wood to a grassy region beyond. In the pine wood I found *Pinguicula grandiflora* (Lam.), and beyond it *Horminum pyrenaicum* (L.), a beautiful, low-growing labiate plant, with a single erect many-flowered spike of largish purple flowers, and radical leaves only. Higher up

I got into the mist and the view vanished; in a few miles the Col d'Aubisque was reached, 5610 ft.; and now began a series of finds enough to make any botanist's mouth water. First, in grassy spots, *Trifolium alpinum* (L.), *Hieracium auricula* (L.); *Carex Davalliana* (Sm.); *Tofieldia calyculata* (Wahl.), a larger species than our Tofieldia; then, on rocks above the road, *Reseda glauca* (L.), a common species in the Pyrenees, but peculiar to them, it has finely divided glaucous leaves; *Sideritis hyssopifolia* (L. f.), a yellow-flowered labiate; *Hieracium saxatile* (Vill.); *Carex frigida* (All.); *Saxifraga aizoon; S. muscoides; S. cotyledon* (L.), the last a splendid plant, with curious calcareous seratures round the thick fleshy leaves, which form a dense rosette at the crown of the root; *Helianthemum vulgare*, var. *tomentosum* (Dun.); *Asperula hirta* (Ram.), another Pyrenean plant, like a small Galium, with flesh-coloured flowers and ciliate leaves; *Erinus alpinus* (L.), plentiful; *Rosa pyrenaica* (Gou.); *Cardamine resedifolia* (L.), a very small species, about 2 in. high; *Antennaria leontopodium* (Gärt.), very plentiful here, but not observed again; this is the famous Swiss "Edelweiss"; *Nigritella angustifolia* (Rich.), (= *Orchis nigra*), a little orchid with dark crimson flowers; *Arenaria ciliata* (L.); *Valeriana montana* (L.); *Sempervivum Boutignianum* (G. and G.), a very pretty, rose-flowered Sempervivum; *Salix pyrenaica* (Gou.), a low, silky species; *Trifolium badium* (L.), with largish brown-yellow heads; *Kernera saxatilis*, a crucifer with white flowers, and roundish pods, placed by Bentham and Hooker under Cochlearia; *Cryptogramma crispa*, *Polypodium calcareum; Betonica alopecuros* (L.); *Hypericum Burseri* (Sp.); *Gypsophila repens* (L.), a caryophyllaceous plant, like a small Silene; and *Rumex arifolius* (L.), very like *R. scutatus*. Past the Col d'Aubisque the road turns to the right, past the head of another valley on to the rocky side of the Pic de Gabizos, and here it enters the department of Hautes-Pyrénées. The road here is a magnificent piece of work, having been blasted out of the steep smooth rocky slope of the mountain for more than a mile, and in one place passing through a tunnel in the solid rock; at some distance off it looks like a shelf cut in the side of the mountain. The rocks here abound in rare plants, but as it was now five o'clock, and I had some six miles to walk to Arrens, the nearest village, before I could get anything to eat, I had not much time to go over them; however, I got a few rare ones, e.g. *Potentilla alchemilloides* (Lap.), the loveliest Potentilla I ever saw; it has leaves like *Alchemilla conjuncta*, only rather smaller, beautifully silvery-white and silky beneath, with a silver edge showing above, the flowers are white, and achenes silky; *Lychnis pyrenaica* (Berg.), with glaucous ovate leaves, and smallish white flowers; *Genista hispanica* (L.), very like a small Ulex; *Ononis striata* (Gou.), a minute yellow-flowered species; *Linaria origanifolia* (Ait.), var. *grandiflora*, a purple almost bell-shaped flower with a patch of yellow on the one side; *Onobrychis montana* (Gaud.); *Antirrhinum sempervirens*, a small white-flowered species with grey fleshy leaves; *Silene Saxifraga* (L.), with greenish flowers; *Dethawia* (= *Wallrothia*) *tenuifolia* (Endl.), a fine-leaved Umbellifer; *Potentilla fruticosa* (L.); *Aquilegia pyrenaica* (DC.), very fine, with flowers much larger than in *A. vulgaris*, and lastly, in fruit only, a most curious-looking Ranunculus (*Ranunculus thora*, L.), with a simple, very wiry stem, and a single large reniform leaf in the middle; it has, as I afterwards ascertained, a yellow flower. The shades of night drew rapidly on, as I descended the long zig-zags which carry the road down the 1840 feet from the Col de Courel to Arrens, in the Val d'Azun. Before reaching the bottom, dark clouds gathered, and in the pitchy darkness, the very road beneath my feet was invisible, except when lit up by occasional flashes of lightning: at last at 9 p.m. I reached the village, and had to ask a woman to show me the inn, for I should never have found it in the darkness. A few minutes after getting in, the rain began to come down in torrents, so I was only just in time. After a good supper of chicken, chops, and coffee, (about a teacupful of strong black coffee, and a pint jug of boiling milk, and a basin to drink it out of), I was glad to get between the sheets, after the best day I ever had except one, and that was on the St. Gotthard and Furka passes, in the Alps of Switzerland. Of course the plants, I have mentioned do not include all I saw, but only the rarer, and non-British plants. Next day rose bright, sunny and clear, after the storm of the preceding day, and I set off to walk to Pierrefitte, at the junction of the two valleys leading to Luz and Cauterets, a walk of only twelve miles; eight down the Val d'Azun, and four up the Argelès valley. Before leaving Arrens, I had a look at the curious old church with its battlemented wall around the churchyard, and the chapel of the Virgin on the little isolated hill of Poey-le-Houn, or Hill of the Fountain. The walk down the Val d'Azun was through a broad fertile valley, with chestnut, walnut, and cherry-trees bordering the road, and in the adjoining fields. In the south of France, and in the warmer valleys of the Pyrenees, the maize is extensively cultivated, to a much greater extent than the ordinary corn, and looks very handsome, with its broad, deep green leaves and branched spikes of male flowers. Along the road from Arrens to Argelès, on the banks and walls by the roadside, *Sedum rubens* (L.), *S. cepæa* (L.), a brittle, much-branched, broad-leaved, and white-flowered species, *S. micranthum* (Bast.), *S. dasyphyllum* (L.), and *S. albescens* (Haw.) are plentiful. Also, in less quantity, *Linaria pyrenaica* (DC.), a sub-species of *L. supina*, from which it is distinguished by the rather larger flowers with greenish veins on the corolla. After dining in Argelès, a fairish-sized town at the junction of the

valleys of Argelès and Azun, I strolled on to Pierrefitte, called at the station for my luggage, which had been sent by rail from Laruns, and turned in to the Hôtel de la Poste, a very comfortable and reasonable one, and a good centre for expeditions. Between Argelès and Pierrefitte, I had not come across much: *Cynosurus echinatus*, *Dianthus armeria*, *Cynodon dactylon*, and *Cucubalus bacciferus*. Next day I set off to visit one of the grandest sights of the Pyrenees, the Cirque de Gavarnie, a walk of twenty-five miles. After leaving Pierrefitte, and taking the valley on the left hand, the road enters a magnificent, beautifully-wooded gorge, with the mountains towering above on both sides, and the Gave de Pau, foaming along sometimes 200 or 300 feet below. In many places the road has been blasted out of the rocky side of the valley, and is all the way to Gavarnie in splendid condition; in many plaees there is a stream of water running along the side, from which men water the road with long-handled ladles. Eight miles from Pierrefitte is the watering-place of Luz, and across the river a mile farther on, the more fashionable one of St. Sauveur, one long street of white hotels and lodging-houses. At Luz the road to Barèges branches off to the left, and there is one of the most interesting churches of the Pyrenees to be seen here. It is fortified by a high battlemented wall, has a covered porch containing curious old frescoes of dragons, two open belfries—one containing two, the other three bells—and a doorway, now walled up, where the Cagots entered and left the church, so that the faithful should not be contaminated by contact with the outcast race. This church was originally built by the Knights Templars at the time when they had the task of guarding the French valleys against the incursions of the Spaniards and Saracens. A little distance past St. Sauveur is the Pont Napoleon, a splendid bridge of a single arch, 216 feet above the stream; the first stone was laid by Napoleon III., and the cost of building 300,000 francs. Past St. Sauveur the road continues up the valley, in some places carried along the precipitous side 300 or 400 feet above the stream, and in others almost on a level with it, till eight miles farther it reaches the pretty little village of Gèdre, where the valley of Héas branches off from that of Gavarnie. A little before reaching Gèdre, a splendid view of the great rock-wall separating France and Spain becomes visible, and conspicuous in the outline is a square gap called the Brèche de Roland, immediately above the Cirque de Gavarnie, but invisible from it, which the legend says was carved out by the Paladin Roland with his sword Durandal, to make a passage while in pursuit of the Moors. At the village of Gèdre lives Mons. Bordère, the botanist of the Pyrenees. I paid him a visit, and found him surrounded by piles of plants in various stages of drying. He and his son collect, while his wife and another person do the drying. He makes expeditions along the whole length of the chain, and across into Spain; and I can strongly recommend anyone, who wishes for a set of good Pyrenean specimens, to apply to him. Up to Gèdre I had found very little of interest, except *Lathyrus pyrenaicus* (Jord.), a variety of *L. silvestris* (L.); *Cystisis supinus*; *Asplenium septentrionale;* and *Cirsium monspessulano-palustre;* but on an old tower at Gèdre I saw a fine patch of *Antirrhinum sempervirens* (Lap.). At Gèdre I had dinner, and one of the courses consisted of izard, the name for the chamois in these regions. The remaining four miles to Gavarnie proved better than all the rest of the way for good plants, *Ligusticum pyrenæum* (Gou.); *Crepis albida* (Vill.), with white-bordered phyllaries; *Aconitum napellus* (L.), var. *vulgaris* (DC.); *Campanula rapunculoides; Paronychias erpyllifolia* (DC.); and *P. polygonifolia* (DC.), the former silvery-white, with its scarious bracts; *Ononis natrix* (L.); *Scrophularia Hoppii* (Koch), with small dark purple flowers on almost naked branches; *Trifolium montanum* (L.); *Sideritis hyssopifolia* (L. f.); *Hieracium saxatile* (Vill.), var. *sericeum* (Loret.); and last, but not least, one of the most lovely plants of the Pyrenees, the *Ramondia pyrenaica* (Rich); here it was gone to fruit, but higher up it was in flower. In habit it resembles a primrose, but the flowers are purple, and in shape and anthers resemble potato flowers somewhat; the leaves (radical only) are deep bright green, densely covered with long shaggy rusty-brown hairs, especially beneath; its habitat is in shady crevices of the rocks, particularly of the huge boulders, fallen from mountains around. Leaving the village of Gavarnie on the right, I took the bridle-path leading straight on to the Cirque, here fully visible, and apparently close to, but really two miles farther on. A little past the village were a number of plants of *Carduus carlinæfolius* (Lam.), and on a large flat space before mounting to enter the Cirque, *Alsine tenuifolia*, var. *Barrebieri* (DC.); *Alchemilla pyrenaica* (Duf.); *Potentilla splendens* (Ram.), a small plant, something like *P. fragariastrum*, but with larger flowers; *Aquilegia pyrenaica* (DC.), var. *subalpina* (Bor.); and *Arenaria grandiflora* (All.) And now I came to the entrance of the far-famed Cirque de Gavarnie, the most wonderful piece of scenery in the range (though this is not the only Cirque, it is much the finest one). Fancy a vast perpendicular wall of black rock forming three parts of a circle, the remainder of the circle being formed of a low mound, as it were, where the stream breaks through; and these walls of rock tower up above for 1500 feet, nothing being visible above but the sky, and, on one side, the edge of a glacier. On the left, and almost opposite the entrance, are two waterfalls, the higher falling almost unbroken for 1300 feet, the highest fall in Europe, except one in Norway. From the entrance across the Cirque is a good mile or mile-and-a-half, the floor being covered with snow and débris from the rocks, the snow forming a bridge across the

stream. At the entrance is a small cabane or inn, and as it was now 7 p.m., I decided to pass the night there. Next morning I rose early, while the mist was still thick, and crossed to the foot of the waterfall; on the way I found *Sinapis montana* (DC.); *Crepis pygmæa* (L.), a small one-headed plant, with stems running down among the loose stones; *Geranium cinereum* (Cav.), with light rose-lilac coloured flowers, very large for the size of the plant, which is only a few inches high; *Vicia pyrenaica* (Pourr.) (= *V. fagonii* (Lap.)), a small erect species, a few inches high, with a large purple flower; *Scrophularia alpestris* (Gay), very like *S. aquatica*, but pubescent and fewer-flowered; *Doronicum grandiflorum* (Lam.), a plant with fine large flowers; *Soldanella alpina* (L.), a very pretty little primulaceous plant, with light blue bell-shaped and fringed flowers, and reniform leaves; *Arabis alpestris* (Schleich); *Anemone Hepatica* (L.); *Gentiana verna* (L.); *Pedicularis pyrenaica* (Gay), very like *P. rostrata* of the Alps; *Pinguicula longifolia* (DC.), a long-leaved var. of *P. grandiflora; Geum pyrenaicum*, with large yellow flowers and lyrate leaves; *Salix pyrenaica* (Gou.), and *S. retusa* (L.); *Erigeron alpinus* (L.); *Myosotis alpestris* (Schmidt); *Arenaria ciliata* (L.) and *A. grandiflora* (All.); *Lotus corniculatus* (L.), var. *alpinus* (Jord.), a very small variety; *Potentilla frigida* (Vill.), a hirsute, acaulescent species, with yellow flowers; *Saxifraga ajugæfolia* (L.), something like small-flowered hypnoides; *Sedum atratum* (L.), *Ranunculus Gouani* (Willd.); *Globularia nudicaulis*, (L.), and *G. nana* (Lam.). Now suddenly the mists cleared away, and the warm sun shone out, tingeing the rocky peaks down the valley a lovely orange-pink, and showing out the dazzling white snowy ledges up above. Crossing over the Cirque, and over the stream by a snow-bridge, on the hill near the entrance I came across *Androsace villosa*, a beautiful little plant of the primrose order, with flowers like tiny white primroses, and hairy leaves, stems, and calyx; *Androsace carnea*, with flesh-coloured flowers and glabrous pointed leaves; *Nigritella angustifolia* (Rich.); *Asperula hirta* (Ram.); *Paronychia serpyllifolia* (DC.); *Gentiana acaulis* (L.), *Thesium alpinum* (Vill.); *Bartsia alpina* (L.); *Rhododendron ferrugineum* (L.), the "Alpine rose"; and *Plantago alpina* (L.), like a small form of *P. maritima*. By this time I was ready for breakfast, and returned to the small inn, demolished an omelette, some bread and butter and coffee, and then set out to walk back to Pierrefitte by the way that I came. Just leaving the Cirque, I found *Helianthemum piloselloides* (Lap.), a variety of *H. canum*, and a little farther on *Potentilla alchemilloides* (Lap.), and *Ramondia pyrenaica* (Rich.), on the huge boulders which were strewed around among the pines, and last, but not least, the magnificent iris of the Pyrenees (*Iris xiphioides* (Ehrh.) *I. pyrenaica* (Bub.), with splendid blue-purple flowers streaked with light orange down the claws of the petals. The leaves are rather peculiar, being fistular. The walk back to Pierrefitte was uneventful, not much of interest turning up; the chief being *Iberis amara* (L.) var., *Forestieri* (Jord.); *Nasturtium pyrenaicum* (Br.); *Lasiagrostis calamagrostis* (Link.); *Melica magnolii* (G. G.), a very beautiful grass; *Linaria pyrenaica* (DC.); and *Libanotis montana* (Cr.), var. *pubescens* (Mat.). After a good night's rest, I set out to walk to the Lac de Gaube, a small lake among the mountains past Cauterets. The way from Pierrefitte to Cauterets lies through a grand gorge, and begins to rise immediately behind Pierrefitte by zigzags, before entering the gorge itself. The six miles between Pierrefitte and Cauterets afford one of the finest drives in the Pyrenees, the carriage-road running all the way along the bottom of a deep narrow valley with wild savage mountains 8000 and 9000 feet high towering up on either side, clothed almost to their rocky summits with dark pines, while the torrent foams and rushes madly along just below. A little before arriving at Cauterets this valley widens, and the small town appears in a basin as it were among the mountains. Cauterets itself is quite a fashionable place to find in the heart of the Pyrenees at over 3000 feet elevation, having above 1700 inhabitants, besides numbers of visitors in the season. There are numerous mineral springs in the neighbourhood, and when I arrived there, the visitors were just returning in troops from taking their morning glass, (not of alcoholic liquors, but of a strictly teetotal drink). Each person takes his own glass, which is carried in a little case, like a puff-box, fastened to a coloured cord, and slung over the shoulder. Outside the baths or drinking-halls are wooden booths for the sale of bon-bons, etc., and I have no doubt but what they are much in request to take after the waters, to judge by the face I saw a corpulent old curé pull over his glass, as he drank off his dose in the porch of the bath-house. About a mile past Cauterets is the spring of La Raillière; here the carriage-road ends, farther on there is only a horse-track, which passes up the Val de Jerez, through a pine wood, close to the stream. There are several good waterfalls in this valley, the finest being one just above the Pont d'Espagne; here the whole volume of water from the Lac de Gaube dashes down into a rocky chasm, and rushes down a narrow passage between the rocks, beneath the new stone bridge. The old bridge, the original Pont d'Espagne, is a structure of tree-trunks thrown across the stream a little lower down.

The Pont is about six miles from Cauterets by a very steep stony path, with grand scenery of rocky peaks, pine-clad cliffs, and here and there patches of snow showing on the higher mountains. Hitherto there has not been much to record in the botanical line for this day, excepting *Lychnis coronaria* (L.), and *Hypericum nummularium* (L.), but on leaving the Pont d'Espagne, and striking up the valley to the

left by a steep path among pines, at an elevation of over 5000 feet the rarer plants began to appear; *Potentilla splendens* (Ram.), *Erigeron glabratus* (Hoppe), *Veronica saxatilis* (L.), *V. fruticulosa* (L.), *Vicia pyrenaica* (Pourr.), *Cerastium arvense* (L.), var. *Pallasii* (Vest.), *Carex pallescens* and *C. ornithopoda*, were the first finds. A little way from the path in some wet grassy ground, I caught sight of a conspicuous lemon-yellow flower, and going up to it found it was the rare *Gentiana Burseri* (Lap.), a beautiful plant with large light-yellow flowers in whorls in the axils of leafy bracts, and growing about 2 feet high; higher up, not far from the lake, grew *Angelica pyrenea* (Spr.), a little umbellifer with dissected leaves, very unlike our Angelica (Nyman places it under Selinum); *Cardamine resedifolia*, *Scleranthus uncinatus* (Schur.), and *S. perennis* (L.). The Lac de Gaube is only a small one, being but $2\frac{1}{2}$ m. in circumference, but the scenery round is very wild and grand; close to it is the Vignemale, the highest mountain on the French side of the range, 10,820 feet, on which there is a fine glacier. Unfortunately on this occasion it was invisible on account of the clouds which covered it. By the lake is a white marble monument in memory of an English couple, Mr. Pattison and his wife, who were drowned while boating on the lake during their honeymoon. By the lake I found, *Senecio adonidifolius* (Lois), *Sinapis montana* (DC.), *Rhododendron ferrugineum* (L.), *Saxifraga muscoides* (Wulf), and *Carduus carlinoides* (Gou.). Climbing up a narrow cleft in the rocky bank, I came on *Geum pyrenaicum* (Willd.), *Adenostyles albifrons*, *Scilla bifolia* (L.), *Trollius europeus* (L.), and last, but not least, a splendid Saxifrage, *S. aquatica* (Lap.), a plant about 2 feet high, and a mass of white flowers, something like *S. granulata* in shape, but in a dense spike. As the time was now getting on, and I had a good walk before me to get back, I left the lake and its wild and rugged grandeur behind, and made the best of my way back to Pierrefitte.

(*To be continued.*)

NOTES ON THE INFUSORIA.

By Bernard Thomas.

IV.

THE Ciliata have been classified by Stein into—

Holotrichous, where the cilia are distributed evenly over the surface, and are of one kind;

Heterotricha, unevenly, and of different kinds;

Hypotricha, in which they are confined to the under or oral region of the body;

Peritricha, in which they form a zone round the body.

The remaining forms belong to the holotrichous Ciliata.

16. *Paramecium bursaria* (Fig. 82 *a*) is about the same size as *P. aurelia*. As the preceding species was called the slipper animalcule, so this, from its rough resemblance, is called the purse animalcule. Its protoplasm contains chlorophyll corpuscles, which are situated in the deepest layer of the ectosarc.

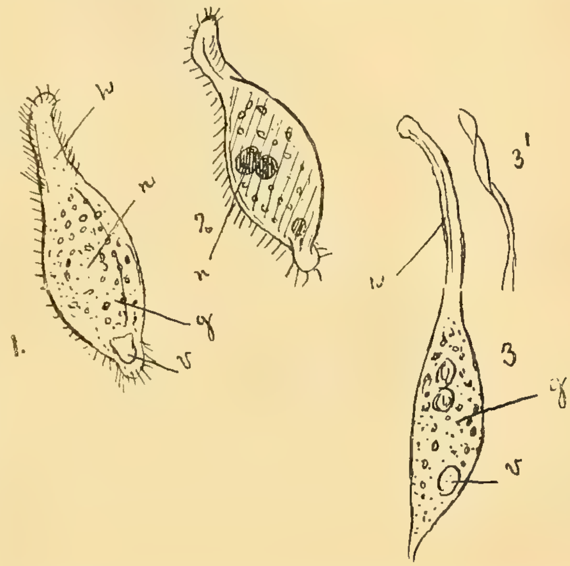

Fig. 81.—1, *Amphileptus fasciola*; *h*, hyaline protoplasm, neck; *g*, granular protoplasm, body; *n*, nucleus; *v*, contractile space; 2, Amphileptus stained with methyl violet, showing double nucleus; 3, *Dileptus folium*, letters the same; 3′, neck wisted.

They are round, and resemble in chemical reaction the green corpuscles of plants. But do they subserve the same function? If so, we have an organism which is in one sense physiologically plant as well as animal. We will study the composition of these bodies when we come to Euplotes.

It was in *Paramecium bursaria* that Balbiana worked out the sexual reproduction by conjugation. In this process the nucleus played the part of sexual organs, and it is interesting to note that the young are described as acinctiform and quite different from the parent. When we come to Aspidiocus we shall see that it is supposed to be the larva of quite a different form known as Oxytricha.

17. *Bursaria vernalis* is represented in Fig. 82 *b*. It is a form similar somewhat to *P. bursaria*, and like it furnished with chlorophyll corpuscles, which in the figure are clearly seen to be placed in the deepest layer of the ectosarc. It differs in its round form, whereas the latter is flat, and in the mouth, which is funnel-shaped and large in *P. bursaria*, but small, slit-like in *B. vernalis*. Both these forms are well

suited for the observation of *cyclosis* (circulation of the protoplasm), in which the nucleus, granules, and corpuscles are seen to participate.

in shape, the anterior part hooked over or beaked, and here the protoplasm is thinner. The myophan layer of the ectosarc is well developed and seen by

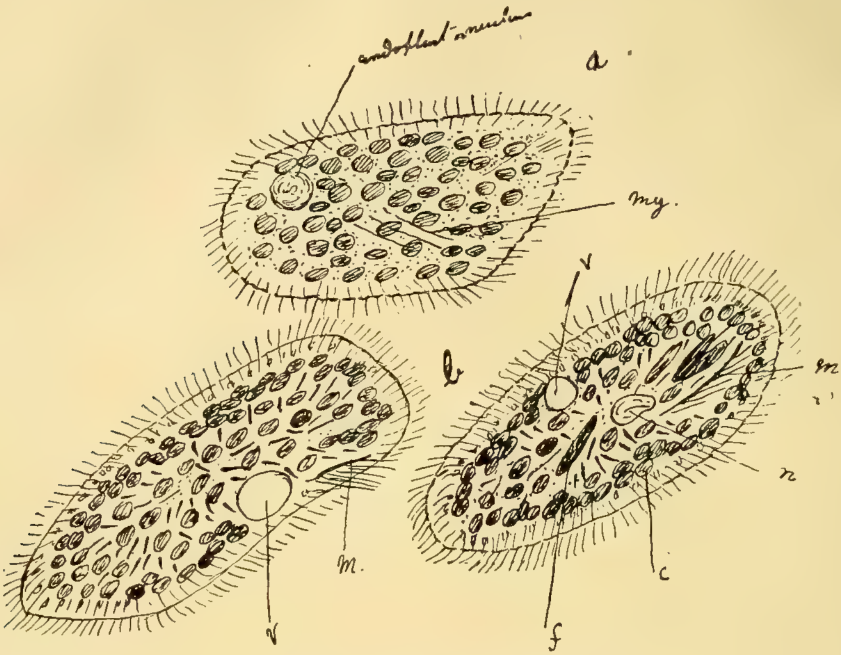

Fig. 82.—*a Paramecium bursaria*; *my*, myophan striation; *b*, *Bursaria vernalis*; *m*, mouth; *f*, ood (diatom); *n*, nucleus: *c*, chlorophyll corpuscles: *v*, contractile space.

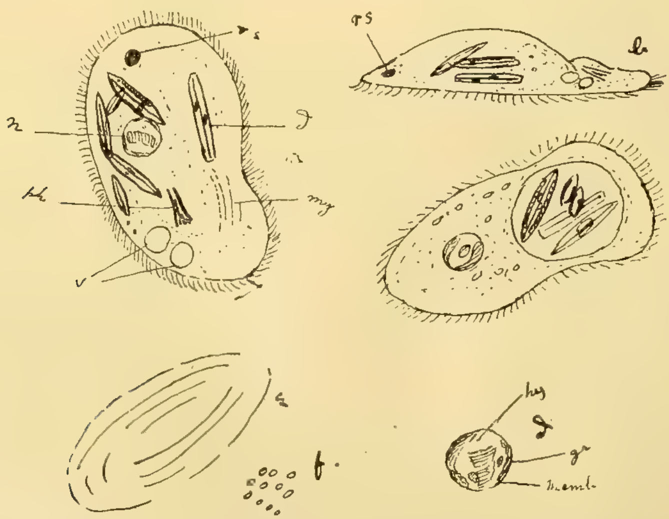

Fig. 83.—*a*, *Chilodon cucullus* front view; *n*, nucleus; *rs*. red spot; *d*, diatom; *ph*, pharynx; *my*, myophan striation; *v*, contractile space;—*b*, ditto, side view; *c*, ditto, with long vacuole containing diatoms; *d*, nucleus, high power; *e*, myophan striation; *f*, granules of endosarc, showing Brownian movements.

18. *Chilodon cucullus* (Fig. 83) is a very common species. It is of fair size though not so large as the preceding, and varies from about the thousandth to the one hundred and fiftieth of an inch. It is oval slightly altering the focus. The appearance then presented (Fig. 83 *e*) is called *myophan striation*. We have here the essentially contractile or functionally muscular layer of the ectosarc. By careful

focussing still deeper, the granules of the endosarc are seen. In the specimen drawn they exhibited what is known as the Brownian movement. This molecular motion is seen when minute particles are suspended in water, and here we may take it as a further proof of the fluidity of the endosarc. There

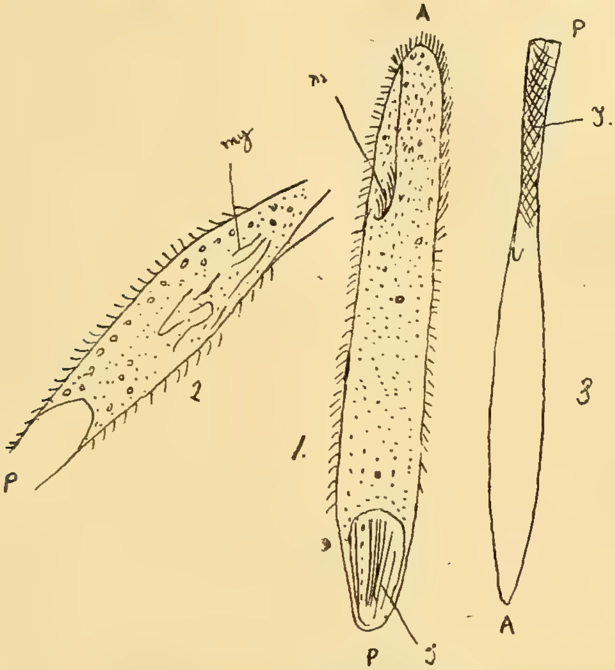

Fig. 84.—*Spirostomum ambiguum*; 1, *m*, mouth; T, striated tail; A, anterior; P, posterior end; 2, middle portion *my*, myophan striation; 3, with spirally marked tail, T.

are two contractile spaces which here again exhibit systole and diastole.

The nucleus is round and seen to consist of a delicate membrane (Fig. 83, *d* memb.) and the faintly granular (*nuclein*, gr. in Fig. 83 *d*) and hyaline material enclosed therein.

There is a red spot frequently seen near the posterior end (Fig. 83 r.s.). There is here, therefore, a common resemblance between this member of the Infusoria and the Algæ before mentioned.

The œsophagus instead of being ciliated, as in many of the Infusoria, is raised into folds which have been described as chitinous rods forming an apparatus known as the pharynx, which is supposed to seize hold of diatoms and force them into its interior. The food of chilodon seems to be diatoms, which may usually be seen in the endosarc. I have seen several occupying one large cavity (Fig. 83 *c*), producing a distortion of outline.

19. *Amphileptus fasiola* (Fig. 81, 1, 2), length given in the Micrographic Dictionary is from the seven hundred and twentieth to the one hundred and forty-fourth of an inch. This infusorian appears in front view somewhat pear-shaped; side view, it is especially thin at the anterior end. The protoplasm may be divided into two parts, that in the anterior region is hyaline, narrow and flat, and constitutes the neck; the posterior body is more granular, broader and fatter, it tapers to a blunt tail, which is again less granular. The neck is turned up at the end, forming a kind of snout. The cilia can be seen, with care, to cover the surface, and at the snout and tail to present the appearance of a tuft. In the posterior region there is a triangular contractile space. The position of the nucleus is marked out by granules which

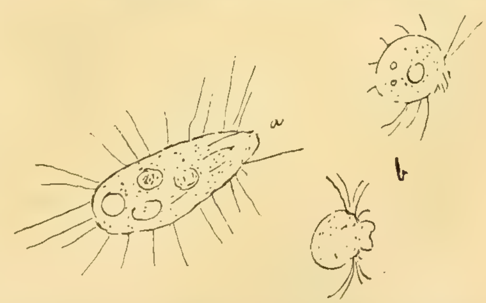

Fig. 85.—*a*, *Enchelys nodulosa* (D.); *b*, *Halteria grandinella*.

surround it, and staining shows a double endoplast situated in this position. The mouth is placed at the junction of the neck with the body.

20. *Dileptus folium* (Fig. 81, 3), the swan animalcule, is somewhat similar to, but much larger than

the preceding. It has a very long and narrow neck, which it moves now in one direction, now in another. In the species figured the neck is leaf-like, and often becomes folded on itself. This organism is clothed with cilia. The length is from the one hundred and sixtieth to the one hundred and twentieth of an inch.

21. *Spirostomum ambiguum* (Fig. 84) suggests a very strange animalcule. It is of large size, about one twelfth of an inch in length, but very narrow, more so than in the figure. It is obtuse or somewhat rounded in front, and truncate behind. It is clothed with cilia. The endosarc is granular, the ectosarc shows a myophan striation. Posteriorly these striæ are strongly marked, and run parallel to the length. The "tail," however, may be so twisted up that the marking appears spiral (Fig. 84, 3). The mouth is situated near the anterior end, it is lateral, and surrounded with cilia. The œsophagus is said to be spiral and the arms (or anal area) terminal.

22. *Enchelys nodulosa* (Fig. 85 *a*) is a very small infusorian. It is of oval shape, truncated in front and rounded behind. The interior contains a nucleus and a contractile space, and there are also food-cavities and granules. The cilia are different from those of other infusoria; they are long and seta-like. Locomotion is effected by jerks, now forwards and now backwards, due to the sudden action of the cilia. It is a very common species.

23, *Halteria grandinella* (Fig. 85 *b*) should perhaps be classed with the Heterotricha, but the similarity of its movements to the preceding is the excuse for here introducing it. When it moves, it does so by sudden leaps and bounds, at one jump vanishing out of the microscopic field, and covering very much more ground than Enchelys. This renders it difficult to make a careful drawing of this species.

SCIENCE-GOSSIP.

We are much pleased to quote the following paragraph from the "Stalybridge Reporter."—A very pleasant afternoon may always be spent at the exhibition of the Ashton field-naturalists. Here is the substance of a little talk with one of them. On a previous occasion he had exhibited a live nightingale, and we asked if the sweet songster was still in the flesh. The reply came in a resigned voice, that the favourite bird had been taken out to a concert on a foggy night and had died as the result. What is the cost of one of these birds? we asked. The reply was that when they were properly acclimatised they cost as much as £5, but one might be had for less if the purchaser would take all risks with a bird which had not been kept long enough by the dealers to be guaranteed against all reasonable casualties. Then our informant observed that at the present time there were people in London keenly scanning the morning papers every day for one particular kind of announcement. If a gentleman in the country happens to hear the nightingale on his grounds, he is irresistibly tempted to write to the *Times* in order to make the world aware of his own existence and the nightingale's. Immediately such an intimation appears, a lot of bird-catchers take train for the spot, and the voice of melody is no more heard in that region. The bird is easily captured, it is carried to the bird-dealers in London, and readily fetches 25*s*. So much for nightingales. Our friend had only an old robin to show, a patriarch of seven or eight years, which he was keeping just to see how long a robin would live.

The geology and mineralogy of "other worlds than ours" is becoming familiar to scientific research. Real diamonds, black and white, have already been found in meteorites—that is, those shooting stars which have fallen to the earth. Now the news comes that gold has been found in a meteorite picked up at Cave City, Calaveras County, California. This stony celestial visitor was about the size of a man's fist, and, it is stated, was found more or less coated or gilt with real gold. One space a square inch in area was continuously gilded.

A new photographic process has recently been brought out, called papyrotint. It is specially adapted for all sorts of drawings in single color, or monochrome, and is said to be inexpensive. A transfer can be taken in greasy ink for transfer to stone or zinc, direct from any negative, however large, without the aid of a medium, the grain being obtained simply by a chemical change. The prints are sharper than by the ordinary processes, while the same negative answers either for a silver print, platinotype, or stone or zinc transfer.

An electrical organ-blower is in operation at Holy Trinity Church, Upper Chelsea. It is worked from the electrical mains of the Chelsea Electricity Supply Company, and the current can be turned on at will by the organist.

The second edition of Dr. J. E. Taylor's "Tourist's Guide to Suffolk" (London: Edward Stanford, 2*s*.) has just been issued, brought up to date: it contains a short but reliable sketch of the geology, botany, entomology, archæology, etc., of that very interesting county.

Mr. Angus Rankin points out that a new factor has been introduced into the study of meteorology—that which treats of the dust-particles in the atmosphere, as well as the number of them present at any time, and the effects of such dust-particles on climate and weather changes. Indeed, it would seem as if the study of dust and its behaviour forms the stepping-stone to the study of nearly all the meteorological problems which deal with clouds and precipitation, solar and terrestrial radiation, as well as the diurnal

and annual variations in the temperature and pressure of the atmosphere. Mr. John Aitkin's "dust-counting" apparatus is used at the meteorological observatory on the top of Ben Nevis, for the purpose of constantly estimating and recording the number of dust particles present in the atmosphere at any given time. One of the conclusions arrived at is that when there is much wind there is little dust, and when there is much dust present there is little wind.

THE astronomer at the Cape of Good Hope, Dr. David Gill, in a communication to the Paris Academy of Sciences a few days ago, presented a photograph he had recently taken in the southern hemisphere. It embraced an area of only two degrees by two degrees, and yet on this very limited sky-space from 30,000 to 40,000 stars had left their impression, besides two nebulæ. An exposure of three hours and twelve minutes had been given to the plate. If this exposure were possible for the whole photographic map of the heavens, about 300,000,000 of stars would be recorded.

MOST people are acquainted with those curious leaf-insects which are common in many parts of the tropics. Their wings mimic leaves both as respects the veins and the green color, and on the ground they resemble leaves so closely that even the ants are deceived thereby. It was pointed out at a meeting of the Linnean Society the other day by Dr. Sharp that this leaf-resemblance of the wings is accompanied by a similarity, amounting almost to identity, of minute structure. The colouring-matter is undistinguishable from the plant-green of actual leaves. Even their eggs partake of this striking resemblance to vegetable products.

A LADY correspondent of the "Spectator" writes as follows:—"Some attention has been aroused by the recent attempt to reproduce monkey-talk by means of the phonograph. It is perhaps not generally known that in a little book, published nearly a hundred years ago, at the sign (strangely enough) of the Tour de Babel, on the Quai Voltaire, Paris, a French writer made an endeavour to reduce the chatter of the tiny marmoset to articulate translatable language. The whistle, or *ouistiti*, from which this little creature has its French name, he describes truly as a long, sharp, piercing sound, repeated two or three times, signifying the want of something or some one. I would add to this, that it is evidently the call used by one to the other. A very young one that I had always cried 'Ouistititi, ouistitititi,' to the older one for help, if it thought itself in danger. 'Ghriii,' a long-drawn high tone, he translates into 'come.' All those that I have possessed have thus called me to come to them. 'Guenakiki' expresses, he says, terrible fear; 'Trouakki,' violent, despairing grief; 'Trouagno,' intense pain, 'save me.' One that had broken its leg thus warned me of it. 'Krrrreoeoeo,' often repeated, means very happy indeed; 'Keh,' a little better; 'Korrie,' annoyed, disturbed; 'Ococo,' deep terror; 'Anic,' feebly and melodiously uttered, means help! protect! 'Quih,' 'I want something very much;' 'Quouéée,' despair of escaping some danger,—this sound I have often heard all my marmosets make at the sight of anything strange to them, or which reminded them of some known danger."

THE April number of the Journal of the Royal Microscopical Society, in addition to Dr. Braithwaite's excellent Presidential address on "Reproduction in Ferns and Bryophyta," has a short paper by Mr. J. W. Gifford on "The Resolution of *Amphipleura pellucida*" (illustrated).

THE Ipswich Scientific Society (President: Mr. E. P. Ridley) held its triennial Conversazione at the Town Hall on May 4th when lecturettes were delivered by the president, and by Dr. J. E. Taylor, (illustrated by one of Mason's splendid lantern microscopes).

THE Annual Exhibition of the South London Entomological and Natural History Society was held on May 6th, at the Bridge House Hotel Mr. H. W. Barber. Hon. Secretary, and Mr. C. G. Durrett, the distinguished entomologist, President.

PROFESSOR TRELEASE, the Principal of the Missouri Botanical Garden, is almost offensively energetic. Here is another capital brochure from his pen—"The species of *Rumex* occurring north of Mexico."

"INSECT LIFE" (appearing in serial numbers, and published at the Government Printing Office, Washington, by the U.S. Department of Agriculture), is always welcomed. Numbers 7 and 8 are devoted to the study and description of the economy and life-habits of insects in their relations to agriculture. The illustrations are all and always excellent.

AT the last meeting of the Geologists' Association, Professor J. L. Lobley read a paper entitled "The Gold of Quartz Veins—an aqueous hypothesis." We should liked to have heard it.

NO science like geology can be named for informing us of the wonderful changes which have taken place on our globe. We know that within the period called Tertiary, gum-trees, banksias, Moreton Bay pines, and other now distinctly native Australian trees grew in England. During the Secondary period the only warm-blooded mammals in Europe were marsupials, resembling those peculiar to Australia. Australia, indeed, is a sort of outlier—a remnant of the Secondary and Tertiary periods. Every now and then some new fossil mammal turns up in the old rocks, but it is almost certain to be of

the Australian type. For instance, a large number of fossil mammalian bones have just been discovered in the Tertiary strata in Patagonia, and they have been proved to be nearly related to the pouched or marsupial wolf (*Thylacinus*) of Tasmania.

IT seems as if the dream of photographers will soon be realised, and photographing in colours will shortly be realised. M. Lippmann has never despaired of it, in spite of disappointments, and he has succeeded in obtaining a more sensitive film than ever. He shows that the complex colours which adorn natural objects should be photographed just the same as the simple colours of a spectrum. M. Lippmann has just submitted four naturally-coloured photographs to the Paris Academy of Sciences, which faithfully represent a stained-glass window of four colours, a group of draperies, a plate of oranges surmounted by a red poppy, and a many-coloured parrot. These showed that the shape is represented simultaneously with the colours. The draperies and the parrot required from five to ten minutes' exposure to the electric light or the sun; the other objects were only obtained after many hours of exposure to a diffused light. On one of M. Lippmann's photos the blue of the sky comes out rather as indigo, but the green of the foliage is accurately rendered. There is no lovelier thing in the world than the solar spectrum, and M. Lippmann has succeeded in photographing this in all its beauty after an exposure of half a minute! At the Royal Society's recent conversazione some of these naturally-coloured photos were exhibited.

HITHERTO the savages of Central Africa have been the only real and original "rain-makers." Now the scientific white men are copying a leaf from their books. We remember reading of the possibility of rain being artificially produced when bitten by love of science by Dr. Dick's "Christian Philosopher" many years ago. Dr. Dick's scheme for artificial rain-making has recently been revived. In the United States and India, dynamite explosions in the upper atmosphere have been tried by balloons. Some have been partially successful; but it is evident that all the explosions in the world would not produce rain unless the air contained sufficient watery vapour. M. Faye, a French scientist of fame, is rather sanguine about the matter. We should not like to throw cold water on artificial rain-making (although that literally might help it), for if it could be effected it would be a grand thing for many parts of Australia and Africa. M. Faye thinks that all the experiments hitherto made have been based on a false theory.

THE Neuroptera form a well-known and familiar order of insects all the world over, including dragon-flies, white ants, etc. Dr. Henry Woodward, F.R.S., etc., in the last number of the "Geological Magazine" figures and describes a British white ant under the name of Palæotermes, which lived in Leicestershire many millions of years ago, when the lower lias limestone of Barrow-on-Soar was being deposited along the then existing bed of the sea. It seems to have been an unusually large specimen of its class.

IN a recent number of the "American Naturalist," there is an account of the work of earth-worms in Yoruba county, West Africa. It appears that here the worms do the work of digging (or turning the soil over), and not the lazy niggers. It would not be a bad idea to introduce these earth-worms to other places—they constitute the cheapest form of labour. The above article, in speaking of their work, says that if we estimate one square yard of dug earth by 2 feet deep as weighing one ton, we have an animal movement of earth per square yard to the depth of 2 feet amounting to 45 pounds. From this it appears that every particle of earth in each ton of soil to the depth of 2 feet is brought to the surface once in every twenty-seven years. This kind of earth-worm also exists in rich alluvium soils of the Nile Valley. How much does Egypt owe to its earth-worms?

ZOOLOGY.

INDIAN TOADS.—I was stationed in Gorakhpur, N.W. Provinces, India, in 1882 or 1883. The then forest officer had just built a new bungalow, with a plinth nine feet high, at Ramgarh, in a clearing in the forest, and I lived with him in it during the hot weather and rains. During the rains the bungalow was invaded every evening after dark by swarms of small toads. This puzzled me, as I naturally thought they gained admission by hopping up the steps; and as these toads cannot hop well, I was surprised at so many getting inside. One night I had occasion to go round the outside of the bungalow with a lantern, and I found that the toads were making their way in, and that they did not hop up the steps; they climbed up by the aid of the right angle formed between the plinth and the steps, placing their backs in this angle and shoving with their hind-legs until they reached the top, when they fell in on the plinth on their backs. They were in such numbers that they formed a complete column reaching from the ground to the surface of the plinth, and I found a similar column in the angle at the other side of the steps. I suppose they were attracted by the lights, either directly, or in the hope of finding insects; but from where they commenced their ascent, at the base of the plinth, the lighted doors were invisible, and, on looking up, merely a diffused glow could be seen. Were the toads attracted by this glow, or do they climb every obstacle they meet?—*J. R. Holt.*

THE LEGS OF MOTHS.—When using my microscope and examining parts of moths, etc., I often

wondered what was the use of the spikes projecting rom underneath the different legs, but could not find anything about it in any book or paper I came across. A few days ago, while sitting near a window and watching (with a pocket-glass) a gnat as it crawled up and down the glass, I saw it place its antennæ between the spikes in question and its leg, and draw it along and thus plume it.—*Herbert H. Clarke.*

"APHIDES AND THEIR MONUMENTS."—In the October number of "SCIENCE-GOSSIP," page 236, is a note of mine with the above heading. At its conclusion I asked for information from some of your entomological correspondents, concerning the beautiful and interesting objects described, but, alas! got none. One good old friend, however, to whom I had written privately, and who is an excellent naturalist and microscopist, knew nothing of the matter, but set to work and soon referred me to Buckton's magnificent monograph published by the Ray Society (four large volumes, beautifully illustrated, and all about a plant-louse, please!!! *) and as, I take it, there are many of your readers who know the happiness of having a great deal to learn, or at least of not knowing everything, I refer them to Vol. 2, page 85, Plate 64; but as that book is not within everyone's easy reach, I will tell, in short, what it says:—A certain minute parasitic fly of the family Ichneumonidæ pierces the body of the living Aphis and deposits its eggs therein. The egg is hatched, the grub thrives, and when full fed "perforates the hard aphis-shell at the belly and commences to spin a double-walled tent between the space comprised by the six legs of the insect. The floor of the tent is attached to the leaf on which the aphis originally fed, the web being carried up to its skin, which then partially forms its roof. Subsequently the edge of the web is reflected downwards so as to form a chamber with double walls . . . . In this cocoon the change into Pupa takes place; and after an interval of about nine days the winged parasite eats its way out of the silken envelope . . . . Not unfrequently the empty skin of the winged Aphis may be seen mounted on the summit of one of these parasitic cocoons." Instead of "not unfrequently," I would say very frequently, judging from my experience of last year, and now is the time for searching the sycamore leaves. In the same volume, page 236, will be found an interesting description of the fan-insect (the abnormal Aphis larva), which I alluded to in your October number. The bundles of stalked eggs are those of the lace-winged fly, more usually found singly.—*Thomas E. Amyot, Diss, Norfolk.*

* The notes of admiration were suggested by the good-natured if rather contemptuous smile of a horticultural friend who has no sympathy with plant-lice, but who saw the book on my table.

BOTANY.

THE MEXICAN AGAVE.—As to the Mexican agave, concerning which a paragraph appears in the May number of SCIENCE-GOSSIP, I have made inquiries at Kew Gardens, and am told that in England this plant does not flower till it is thirty, forty, or sixty years old, that is, not till it has completed its growth. When it is full grown it flowers. After flowering the plant always dies, but new plants grow from the base. The "report like a rifle-shot" is an exaggeration, but each flower-bud as it opens makes a slight noise of the kind, like ripe fuchsia-buds do when pressed. This, in the agave, is caused, I am told, by the fact that the bud before opening contains no air, and it is the inrush of the air which causes the noise.—*Frank Sich, jun.*

NOTES ON THE ADDITIONS TO THE BRITISH FLORA SINCE THE PUBLICATION OF THE LAST EDITIONS OF BABINGTON'S MANUAL AND HOOKER'S STUDENT'S FLORA.—I have been repeatedly asked, and urged to give a list of the above additions, with short characters to separate them from our other well-known species. But they have become so numerous, if we take in the hybrids and varieties, that it has become no light task to compress such an account into anything like a reasonable length. What I here propose to do is to go through the principal additions only, leaving out hybrids, and perhaps some varieties. I would refer all those who seek for further information to the forthcoming supplement to the 3rd edition of English Botany, edited by Mr. N. E. Brown of the Kew Herbarium. Here the additions will be figured and described fully, at the same time the matter of the original work will be brought up to date as far as possible. Good progress has been made in the study of the distribution of our Flora since the publication of the 2nd edition of Watson's Topographical Botany, and if some means could be found to cheapen that work so as to make it accessible to a larger number of our botanists, it would be a great advantage. A large mass of additional matter has been accumulated, especially as to Scottish botany, and I should like to say that I should be glad to see specimens of any species unrecorded for any county in Topographical Botany. There is still much work to do in this department of British Botany, as to verification of doubtful localities, etc.; while the subject of the life-histories of our plants is hardly yet touched. I have adopted the nomenclature and sequence of the 8th edition of the London Catalogue of British Plants as being available to all, giving however, a second name where it seemed needful, and to give more help. It will be seen that I attempt no technical characters, but merely such as are usable in the field, and what may be termed off-

hand differences, etc. In Rubus and other genera, I do not attempt any descriptions (merely a list), as even with full descriptions it is very difficult to make them out, which can only be done by the aid of actual specimens named by specialists in the genus. Sets of British Rubi are now being published by Messrs. Linton, Murray, and M. Rogers. For the Characeæ, reference must be made to the papers of Messrs. Groves in the "Journal of Botany," and to the sets of dried specimens they are now issuing.—*Arthur Bennett.*

PRESERVING HEPATICÆ.—A very good way of preserving the more minute species of the Hepaticæ, especially the Jungermanniaceæ, as dry specimens is as follows:—First select your specimens, the most normal possible, and wash their roots well in water with a small brush; now remove them on to a clean

Fig. 86.—*Jungermannia bicuspidata.* × 10. From a dried specimen.

glass slide with a drop of some preservative fluid (dilute corrosive sublimate in spirits of wine), take a clean folded piece of thin shiny paper, and write the date, etc., on one side, now reverse your slide and float as it were the plants on to the paper; this may now be placed between sheets of absorbent paper in the ordinary way. When they are thoroughly dry they may be gummed on pieces of fine white paper, and the paper pinned in the drawers of a cabinet, or gummed as herbaria. I thought it might be useful to those who study this beautiful class of cryptogamous plants, it being the most advantageous, the fluid not only preserving them, but allowing them to assume a very natural and therefore graceful position.—*Henry E. Griset.*

GEOLOGY.

THE PROBABLE COAL-FIELDS OF EAST ANGLIA.—One of the most important meetings ever held in Ipswich, took place on May 6th at the Town Hall. For some time past, in his public lectures and in articles contributed to the newspapers, Dr. J. E. Taylor, of the Ipswich Museum, has stated his opinions as to the probability of coal-fields occurring in the Eastern Counties, and the intense interest which has been aroused in the question was evidenced by the attendance at this gathering. Mr. Whitaker, F.R.S., etc., had travelled all the way from Southampton to attend the meeting. This gentleman was in charge of the Government Geological Survey for Suffolk and Norfolk for eleven years, and his memoirs on the subject are published by the Government, as are also those of Mr. T. V. Holmes, F.G.S., etc., who had also come up from Eastbourne to attend this meeting. Reports were read from Messrs. Whitaker, Holmes, and Taylor, on the possibility of coal-measures occurring in Essex and Suffolk, and Mr. Whitaker prefaced the reading of his own, which was the longest and most-elaborately prepared paper, by stating that none of the experts present had consulted together, so that their reports were purely personal. The one fact that struck the meeting was the wonderful unanimity of opinion of the scientific experts as to the probability of finding coal in East Anglia. The various questions arising were severely criticised and discussed from a practical point of view, the chief difficulty evidently forefronting those who regarded the subject from a business aspect being the position of the landowners. Unfortunately, no representative of the landowning class was present to speak on this question, although it was felt by the commercial gentlemen present that the landowners might eventually be those most profitably interested. The meeting afterwards resolved itself into a General Committee to take action in the matter, and to call in the aid, if necessary, of the scientific experts—Messrs. Whitaker and Holmes, and Dr. Taylor—for advice in their future deliberations. In the end a sub-committee was formed for the purpose of considering the advisibility of selecting the best probable sites for coal-search borings in Essex and Suffolk. The subject was thoroughly discussed, and there can be very little doubt, now that the enterprise has been publicly started, that some means will be devised of bringing this problem to a practical solution.

NOTES AND QUERIES.

HERR F. S. ARCHENHOLD has published in the "Astronomische Nachrichten" his discovery, by means of photography, of a large nebula in the constellation Perseus, which showed about the same intensity in the photograph as the nebula in Andromeda. In the centre of the nebula there is an empty space, the nebulous matter seeming there entirely missing. Its length from the south-east to the north-west is about three degrees. What is remarkable in this discovery is that no nebula in that place is marked in old astronomical maps, and in the latest a very weak nebula is marked, while the one photographed by Herr Archenhold is one of the very brightest, though, when looked at through the strongest telescopes, it is barely visible.

THE DIPTERIST.

Who has horny beetles found,
Scratching, crawling on the ground,
That with Diptera can compare,
Diptera dancing in the air?

Floating on transparent wing
Where the rippling waters spring,
Dipping here and dipping there,
Pretty dancing Diptera.

Flitting with melodious hum
O'er the sugar mixed with rum;
Humming here and humming there,
Dreamy, dreamy Diptera.

Swarming o'er the stagnant lake
For the water-lilies' sake.
Whirling, rising in the air,
Countless, countless Diptera.

Flying in the pitch-dark night,
Basking in the broad sunlight,
Here and there and everywhere,
Omnipresent Diptera.

SEA-SPINACH.—During a recent short visit to Littlehampton, I was offered at dinner some sea-spinach, as my friends called it, which the children had gathered on the shore at some little distance from the town, and which differed but little in taste from ordinary spinach. I had no opportunity of examining the plant, which I presume was *Atriplex portulacoides*, or (as it is sometimes called) sea purslane. Do any of your readers know whether this is ever called sea-spinach?—*W. T. Lynn, Blackheath.*

FOGS.—Eight years ago, in the lecture he delivered before the British Association meeting at Montreal, Professor Lodge showed the possibility of dispersing fogs by means of electricity, and even went so far as to suggest the manner in which it could be done. The suggestion at length appears to be on the eve of practical trial in the city of New York. Indeed, secret experiments are stated to have been already carried out at Sandy Hook and in Boston Harbour with such success as to warrant the rest being undertaken on a more extensive scale. The largest area of fog stated to have been cleared at one discharge was a radius of 150 ft., or 70,500 square feet. The atmosphere of the cleared area had washed the fog down. It is suggested that this fog-clearing electrical apparatus shall at once be applied to the great transatlantic liners. Why not experiment with it in tunnels and underground railways, and in purlieus of large stations and complex junctions where dense fogs produce so much danger and anxiety?

THE SUN'S REFLECTION IN STILL WATER.—Have you ever noticed the sun's reflection in still water? This afternoon I saw through a small telescope what seemed to me a discovery, water magnified, and with the telescope I saw the flame around it, and, as it appeared to me, its motion; also the corona appeared to be of a deep purple. I do not know whether you or anyone else has observed the sun in this manner; it is my opinion you would be able to see something wonderful with a powerful telescope. I may or may not have made a discovery. I am not a scientist, so I cannot be expected to know, or expect you to notice this from me; but, if you don't mind, I should be pleased for you to notify it if you would not deem it presumptuous.—*D. F. Webster.*

THE AMERICAN ALOE.—In response to W. J. Horn (page 118 of this volume), I can say that for many years I have had the American aloe growing under my observation in South China. Writing from memory only, I should say that the plant, under the climatic conditions there prevailing, flowers about the eighth or tenth year of its growth, and then dies. In the meantime, indeed during the greater part of the eight or ten years, numerous suckers (I know nothing of "lateral buds") have sprung from the ground within a radius of three to four feet from the parent plant, and these, if transplanted, rapidly develop into full-grown plants. At Canton the Chinese name of the plant is Manila hemp, because, it is said, in the Philippine islands the fibres of the leaves are used to make coarse textile fabrics.—*Theo. Sampson.*

VERTIGO PUSILLA IN LANCASHIRE.—While collecting at Silverdale, Lancashire, in July last, I took several specimens of the rare *Vertigo pusilla.* This is the first record of it for Lancashire. I got them from among moss at the bottom of a wall, in company with *H. rupestris*, *H. pulchella*, *V. pellucida*, and other commoner species.—*F. C. Long, Burnley, Lancs.*

PIOPHILA CASEI.—Will some reader kindly answer the following questions about the fly (*Piophila casei*). (1) How many eggs is this fly able to lay? (2) How long does it take for the eggs to develop into the grub? (3) Does the winter kill the grubs if not fully developed? (4) How long does it take from the egg to produce the fly? I find in several books I have looked up about this fly, the description of it is very poor.—*J. C. Wright.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

TO ANONYMOUS QUERISTS.—We must adhere to our rule of not noticing queries which do not bear the writers' names.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply DISGUISED ADVERTISEMENTS, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges," which cannot be tolerated.

WE request that all exchanges may be signed with name (or initials) and full address at the end.

SPECIAL NOTE.—There is a tendency on the part of some exchangers to send more than one per month. We only allow this in the case of writers of papers.

TO OUR RECENT EXCHANGERS.—We are willing to be helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

C. PEMBERTON.—We do not think he could either "buy or get a piece of marsh in exchange." He will have to collect the marsh plants, taking each up carefully with a good portion of the wet soil attached to it (just as he would transplant in his garden), placing them side by side in a shallow pan, filling up the interstices, as described in the "Marsh Garden," with marsh moss (sphagnum). I shall be happy to give any further information asked for, but think C. Pemberton will find no difficulty in making a "marsh" such as described in SCIENCE-GOSSIP. I never heard of or saw one till I made that experiment. If C. Pemberton sends his address to I. Grierson, 17 Bentinck Street, Manchester Square, London, W., I will, if possible, procure some marsh plants for him.

DR. B. AND OTHER ENQUIRERS.—Mr. F. V. Theobald's "British Flies (Diptera)" is published by Elliott Stock, 62, Paternoster Row.

M. B. UNDERHILL.—"The Cockroach," by Professor Miall (illustrated), was published in SCIENCE-GOSSIP, vols. for 1884 and 1885, and afterwards republished in the volume form by Macmillan.

W. K. writes as follows: Herts, May 2, 1892, "I should be much obliged if any of your readers could tell me if there is such a thing as a botanist of approved capacity who undertakes to name (and return) British plants sent to him (especially during August and September). I have often felt the want of such a resource, when bicycling, and unable to preserve doubtful specimens till again reaching the sphere of books and authorities."

ARAMIS.—Johns' "Flowers of the Field," 5*s*., published by S.P.C.K. "Illustrations of the British Flora," by Fitch and W. G. Smith, 10*s*., published by L. Reeve & Co.

A. LAUNDER.—Taylor's "Flowers, their Origin, Shapes, Perfumes, and Colours," is now published by W. H. Allen & Co.; Dr. Master's "Vegetable Teratology," by the Ray Society.

EXCHANGES.

ROSS microscope, latest pattern, swing arm sub-stage, rotating stage, 1 inch and ¼ inch objectives, double nose-piece, paraboloid, spot lens, live cage; also a Beck's Star and accessories, offered in exchange for high-class works on mechanics' or ships' chronometer.—Dr. Purcell Taylor, 57 Chancery Lane, London.

WANTED, British and foreign marine curiosities, as star-fishes, crustacea, sea-urchins, and any of the following shells, as *Isocardia cor, Cochlodesma prætenne, Clio pyramidata, Mactra helvacea, Limnæa involuta, Vertigo moulinsiana, V. pusilla, Acme lineata, Tapes aurea, Cardium papillosum, Diplodonta rotundata, Lima hians, Terebratula caput-serpentis, Ovula patula, Akera bullata, Aplysia depilans, Helix aculeata, H. pulchella*, or any rare varieties of helix, in return for minerals, fossils, microscopic material and objects, or rare British shells, viz., odostomias, rissoas, *Scalaria clathratula*, cæcums, *Mangelia turricula, Defrancia Linearis, Lachesis minima*, tapes, psammobia, cerithiopsis, *Barleeia rubra*, etc.—A. J. R. Sclater, M.C.S., Natural History Stores, The Strand, Teignmouth.

WANTED, to correspond with collectors who may have foreign stamps to offer in exchange for shells.—T. E. Sclater, Northumberland House, Teignmouth, Devon.

OFFERED, British marine shells in exchange for shells not in collection, or insects and micro. slides; will also give exchange for the "Life of Thomas Edwards, Banff Naturalist."—W. D. Rae, 17 Strafford Street, Millwall, London, E.

OFFERED, Newman's "British Moths," Kirk's "Physiology," Ganot's "Physics." Wanted, "Carpenter on Microscope," works by Gosse, or offers.—G. A. Barker, 24 Avenue Villas, Cricklewood, N.W.

WANTED, scientific apparatus in exchange for Cornish rocks, minerals, and fossils.—W. H. Olver, 2 Adelaide Terrace, Truro.

WANTED, a clean, unmarked copy of "The London Catalogue of British Mosses and Hepatics," 2nd ed., 1881. Will give good exchange in plants or slides.—W. Mackie, 77 Napier Street West, Oldham.

WILL exchange first-class anatomical and botanical micro. slides for good foraminiferous material, dredgings, etc.—W. White, 17 York Street, Nottingham.

A FEW duplicates of rare British flowering plants (dried), British and foreign marine shells, British fossil shells, British land and freshwater shells, and British mosses, all correctly named, offered in exchange for foreign land shells.—T. R., 27 Oldham Road, Manchester.

WANTED, any of the vars. of unios or anodontas, for *Vertigo pygmæa*.—John Radcliffe, 111 Oxford Street, Ashton-under-Lyne.

BRITISH marine shells.—*Pecten tigrinus* (small), *Cyanium minutum, Tectura testudinalis, Lacuna pallidula, Lacuna divaricata, Rissoa cancellata, R. parva, R. striata, Otina otis*. Wanted, British marine shells not in collection.—James Simpson, 6 North St. Andrew Street, Aberdeen, N.B.

OFFERED, *Acme lineata, Vertigo substriata, V. edentula, Zonites excavatus*, and var. *vitrina, Z. glaber, Helix lamellata, H. aculeata*, and several other shells, for nests and eggs of goldfinch, hawfinch, nightingale, and fire-crested regulus, or other rare nests.—Joseph Whitenham, 82 Cross Lane, Marsh, Huddersfield.

SCIENCE-GOSSIP for 1888 and 1889, also "Naturalists' World" for 1886 and 1887, unbound, perfect. Should be glad to exchange for a few micro. slides, botanical or entomological preferred.—F. C. Long, 32 Woodbine Road, Burnley, Lancs.

NEW student's microscope, with rackwork sub-stage, by Baker, also lamp, Cathcart microtome, Cole's section cutter, and other micro. apparatus; Such's "Physiology of Plants," De Barry's "Anatomy," Bower's "Practical Botany," and other scientific works.—J. H., 19 Lambert Villas, Brixton Hill, S.W.

DUPLICATES.—*Cæcum trachea, Homalogyra atomus, circe, Scrobicularia tenuis, Odostomia spiralis, O. pallida*, etc. Wanted, mollusca not in collection.—B. Tomlin, The Green, Llandaff.

THE last twelve volumes of SCIENCE-GOSSIP, in numbers, clean and complete; exchange offers.—Jas. Hedworth, Dunston, Gateshead.

OFFERED, "Natural History of Insects" (London: Murray), second edition, 1839, in two vols., published at 5*s*. each, unsoiled and perfect; SCIENCE-GOSSIP for 1887, "Naturalists' Gazette" for 1888. Wanted, any good foreign shells not already in collection.—W. Jones, 27 Mayton Street, Holloway, London.

FLINT implements and flakes wanted from localities near London.—G. E. M., 5 Warwick Place West, London, S.W.

WANTED, diatoms and other good slides. Offered, micro. mounts of larvæ of ant-lion, stained forams, etc., also set of diptera and other micro. material.—W. E. Green, 24 Triangle, Bristol.

DUPLICATES: 40 species of British butterflies, about 500 specimens in all. Desiderata, British dragonflies, fresh and unset preferred; also British orthoptera, particularly mole-crickets, field-crickets, and locusts.—W. Harcourt Bath, Ladywood, Birmingham.

WHAT offers for a small six-drawer cabinet suitable for birds' eggs and shells.—112 Rann Street, Birmingham.

WANTED, cuckoos' eggs with clutches of the following species: garden warbler, redstart, reed warbler, common wren, red-backed shrike, nightingale, chiff-chaff, woodlark, common bunting, house-sparrow; good eggs offered in exchange.—W. Wells Bladen, Stone, Staff.

LOT of novels and other books for exchange. Wanted, fossils from any formation except carboniferous; lists exchanged.—Walter C. Shields, 36, Gartusk Street, Crosshill, Glasgow.

Voluta musica, Neritina viridis, Tellina radiata, T. (strigilla) Rombergii, Planaxis lineatis, Bulimus exilis, Helix aspersa, and *H. lactea* (from Gibraltar), *Echinus sphæra*, and others, for land or marine shells, fossils or minerals not in collection. J. Burman Rosevear, Roselea, 51, Crouch Hill, London, N.

BOOKS, ETC., RECEIVED FOR NOTICE.

"The Idler," (London: Chatto & Windus).—"English Botany, or Coloured Figures of British Plants," (London: George Bell & Sons).—"Journal of the Royal Microscopical Society," (Williams & Norgate).—"The Apodidæ," by H. M. Barnard (London: Macmillan).—"Transactions of the Yorkshire Naturalists' Union," parts 10–16.—"Gentleman's Magazine."—"The Mediterranean Naturalist."—"The Midland Naturalist."—"The Naturalist."—"Natural Science."—"American Microscopist."—"American Naturalist."—"Nature Notes."—"Essex Naturalist."—"Journal and Proceedings of the Essex Field Club," etc., etc.

COMMUNICATIONS RECEIVP UP T^ THE 12TH ULT. FROM: J. A. S.—W. H. N.—A. J. S.- T.—J. E. S.—S. G.—W. T. L.—W. D. R.—H. 4 -D. 1. W.—I. H.—J. F. H.—F. G. S.—W. K.—T. R.—A P.—F. S.—W. W.—H. H. C.—W. M.—D. W.—T. S.—H. K.—W. H. O.—H. W. B.—C. C.—I. S.—E. M. B. U.—I. R.—G. A. B.—I. G.—R. D. P.—A. B.—T. E. A.—F. C. L.—R. D. P.—W. E. G.—W. J. J.—J. H.—B. P.—Q. B.—G. E. M.—Dr. P.—J. H.—W. H. L.—W. H. B.—B. T.—F.—R. B. P.—E. H. J. B.—J. B. R.—W. K.—M. E. A.—W. C. S.—B. P.—W. W.—Lord H.—A. W. L.—B. T.—H. B. W.—etc., etc.

SEAFORD—RECREATIVE AND SCIENTIFIC.

BY EDWARD A. MARTIN, Author of "Glimpses into Nature's Secrets," "Amidst Nature's Realms," etc.

THE town of Seaford is by no means an unknown seaside place of resort. Many a one, tired and bored by the constant calls which are made on one's energy at fashionable sea-side places, has found in this town, nestling, as it does, in a hollow in the chalk downs, the place which had long been sought for as likely to contain those re-energising requirements of the busy city-man, which are in vain looked for in the mighty and busy rivals of Hastings, Eastbourne, Brighton, and the like. Even now, quietly and with little of that public light which is thrown upon the doings of the greater sea-side towns, Seaford is preparing to welcome, nay, is already welcoming the early season comers, who, tired and out of sorts by reason of the severe winter—or by the influenza, are hurrying off to catch the first summer channel-breezes, irrespective of whether it be now the "season" or no. What have people in pursuit of health to do with the "season"? Season, indeed! Cannot they live without a "season"? can't they enjoy the benefits of the sea without having a sight of the same bores who were so terrible during the last London "season"? But we don't go to Seaford for the "season"; we go, if you like, to wear out our old clothes, for no one will be any the wiser in this early summer which we are choosing, and after all, there is a comfort about familiar things which is not exactly possessed by the first-class tourist suit just turned out by the tailor. Seaford is reached by means of a delightful journey on the Brighton line, during which it is guaranteed that one needn't change more than three times. As Seaford is the teminus of the branch line, the amount of traffic is not very great, and consequently the visitor experiences but little disturbance from this cause.

Situated like so many of its sister-towns on the south coast, in a "gap" in the cliffs, there is little doubt that at a former time, probably before the town commenced to exist, the hollow of the valley was the estuary of one of those many rivers which flowed through the chalk area, draining the uplands and in many cases the Weald beyond them. Geologists tell us that the final denudation of the chalk hills could only have taken place by means of innumerable streams and rivers intersecting one another and flowing in the hollows which now intersect the Downs in every direction. The site of Seaford was probably the outlet of some of these streams, besides being supplied, at least until recently, by the river Ouse, although this now makes its entry into the sea at Newhaven.

In front of the town lies a stretch of land known locally as the "Bemblands." The original entry of the river was evidently made here, for we read of a deed executed in Elizabeth's reign granting all the land known as the "Beamelands," extending on both sides of the mouth of the river, to two gentlemen mentioned by name. Since the time of this grant, the river has shifted its mouth more and more to the west, probably in part owing to the silting up of its ancient bed, until finally it was left no more to its own sweet will, but was secured to make its entrance into the sea at what was thenceforward known as "New Haven."

Seaford was one of the ancient Cinque Ports. Although not one of the original, it was certainly not the least important of those subsequently added.

Looking at the town as we now see it, we can scarcely imagine it ever to have been a port at all. But when we find that the river Ouse originally entered the sea in front of the town, and that Seaford Cliff formerly was the eastern boundary of the river, the fact that it was at one time a port is easily understood. Instead of debouching at Newhaven, as it does now, the main body of water passed to the east and extended along the front of the town, where it mingled with the sea probably by numerous shallow mouths. Its former course is now marked by the stretch of stagnant water which lies just within the shore between Newhaven and Seaford, and which, presumably influenced by the tides, gave the water-power by which the mills at Bishopstone were worked.

Seaford, we read, sent a large complement of ships and men to join the British fleet opposed to the Great Armada, so that it was far from being an insignificant port so recently as Queen Elizabeth's reign. Geological changes as a rule extend over a long lapse of time, but here we have an important instance of a river changing its mouth within a comparatively short period.

Those who have visited the town have doubtless noticed the high cliff on the east of the town, and perhaps have experienced the bracing air which is to be found at the head of the cliff. Should the town extend thus far at some future time, what a magnificent site it would afford for an hotel or a hydropathic establishment. There would, however, be one drawback, and that would be the soil. The chalk here is covered by the relics of a formation similar to, and probably identical with, those found on the Castle Cliff at Newhaven: (I have no idea why it is called Castle Cliff; the fort there is no more like a castle than a cathedral). Here are found a series of strata of tertiary age belonging to the eocene formation, similar to those strata on which London is situated. At Brighton, again, a patch of eocene clay is existent at Furze Hill, and it would appear that these are all remains of one wide sheet of tertiary accumulations which once covered the whole of the chalk of the south of England, and were continuous one with another.

Immediately above the chalk of the Seaford cliff there appears a thick layer of flints, rolled by the action of the sea in times long past into the various shapes we find on the beach at the present day. The sand which was then deposited above the layer of rolled flints very naturally filled up all the crevices left between the flints. Very possibly the sand, which is of a ruddy colour, was derived from some source where it was mingled with iron ore, for we find both sand and flints have now been cemented together by the action of peroxide of iron, and form a reddish-brown conglomerate, or pudding-stone, so-called from the fanciful appearance which the flints present to the plums in a pudding. This conglomerate is very hard and lasting, and would, I imagine, if capable of being dressed, make a durable building-stone. Large boulders of it were seen piled in a heap, and were evidently to be used for some purpose, possibly for road-making. Immediately above this conglomerate of the Seaford cliff is a thick bed of sand, which probably corresponds with that formation known in the London basin as the Thanet sands.

Above this occurs in some parts a bed of stiff clay, which it would be necessary for the speculative builder to remove before he established his sanatorium on the hill. The clay-bed is found also in the Newhaven cliff, where it is full of casts of shells, and sometimes the shells themselves, of the genus *cerithium*. So full is it that a piece of the shell-clay which I have in my collection, has, after becoming thoroughly dried, assumed the aspect of an unpolished piece of Sussex marble, except that of course the shapes of the shells contained are different.

The change in the course of the river which once entered the sea at Seaford, has left the town with a task before it. What will the town authorities do to make the Bemblands a little more presentable, and more a credit to the town? Might not this waste land be laid out as ornamental gardens, with perhaps a band-stand therein? Seaford is far from being an unknown place to seaside visitors. What is being done to attract them to the town? Such gardens would prove a great attraction, and would serve as a promenade which would be close to the bracing air of the sea, and at the same time would be sheltered by the sea-wall from the powerful south-west winds. It may be said there is an objection to the utilization of the land for these purposes. There is in some places a quantity of stagnant water which it is difficult to keep out, rising and falling as it does with the tide. If a thing is to be done at all it should be done properly, and means no doubt would be found by which the water could effectually be kept out. The surface of the ground could be raised upon piles, or, better still, upon rent-paying arches, or a thick layer of impervious concrete could be laid down. A natural concrete is ready to hand. The conglomerate of which I have before spoken is sufficiently indurated to be used at least as a foundation for such a purpose. The difficulty of preventing the water from rising is surely one which could be easily surmounted, and the town would possess a most potent addition to its attractiveness. The sea-wall is not in very good condition. All it serves to do at present is to show the inferior quality of the materials with which it was made, for it is breaking out on all sides. And the Martello Tower, which many sea-side towns would be glad to possess, appears to be falling to pieces. What a pity it is not in the hands of the town authorities!

There are many advantages which the town possesses which should be made the most of, but if Seaford is ambitious to shine as a watering-place, it must quicken itself, and pursue a more active policy in the future.

NOTES ON NEW BOOKS.

ISLAND LIFE, by Dr. A. R. Wallace (Macmillan & Co.). We are delighted to welcome a cheap edition of this noble and most suggestive book. We know of nothing in natural history literature to equal it, except Darwin's classical *Voyage of the Beagle*. In its two volume form, Mr. Wallace's splendid book was practically unobtainable to naturalists, the most distinguished of whom, are as a rule the poorest. Hence we regard it as a real boon that Messrs. Macmillan, the publishers, have now issued a cheap edition of this work which Dr. Wallace has taken considerable and careful pains to bring up to date, so as to say the latest words on the subject.

On the Modification of Organisms, by David Syme, (Melbourne: George Robertson & Co. London: Kegan Paul, Trench & Co.). This is a difficult book to notice. The author makes some clever points, although his style is neither classical nor attractive. He evidently thinks that Darwin knew nothing about Darwinism, as will be seen by the following quotation, which is on the fifteenth page of the book. "*Summary.*—We have seen that Darwin's language is wanting in precision, and his definitions and theories are variable and contradictory. In one place natural selection is the 'struggle for existence,' in another, the 'struggle for existence' is said to 'bear on' natural selection; in a third place he speaks of the 'struggle for existence, and natural existence,' as if they were independent principles; in one place, again, he defines natural selection as 'the survival of the fittest,' thus confounding cause with effect, and in another place he says that natural selection 'depends on' the survival of the fittest; while to add to the confusion he tells us in another place that 'the conditions of life include natural selection,' inasmuch as they determine whether this or that variety shall survive. In numerous places he explains that the function of natural selection is merely selective, as the term implies, that it operates on variations which are provided for it, and is absolutely powerless to effect anything without them; in other places he insists that variations are created by natural selection, and that, in fact, every change in structure and function is within the power of natural selection."

Laboratory Practice; a series of Experiments on the Fundamental Principles of Chemistry, by Josiah Parsons Cooke, LL.D., (London: Kegan Paul, Trench, Trübner & Co., Ltd.). It is a mighty jump from 1874, when Dr. Cooke, the distinguished American chemist wrote one of the most suggestive volumes of the International Scientific Library series, entitled "The New Chemistry." No other book has done more since then to suggest new lines of thought to thoughtful chemistry students. It is therefore with sincerest pleasure we draw our readers' attention to this practically valuable book. Its aim and scope will be best gathered from the following quotation from the introduction. "The educational value of such a course as is here outlined, depends entirely on the manner in which the work is directed and supervised. The student should be instructed, by continued reiteration, if necessary, 1. To observe the minutest particular in regard to every experiment. 2. To distinguish essential from non-essential phenomena. 3. To draw correct inferences from the results. 4. To express concisely but clearly in writing the facts observed and conclusions reached."

Mineralogy, by Frederick H. Hatch, Ph.D., F.G.S., (London: Whittaker & Co.). We cordially recommend this cheap little book of Dr. Hatch's as one of the best that students could purchase. It is abundantly illustrated, and Dr. Hatch is one of the few scientific teachers who possess the gift of lucidity.

Theoretical Mechanics, Elementary Stage, by J. Spencer, B.Sc., etc. (London: Percival & Co.). Mr. Spencer is one of our most active workers in educational science, but we are sorry to find it necessary, and that the science and art department of South Kensington is constantly requiring such hosts of victims, under the title of preparatory books. However, if students require a cheap and good manual on Theoretical Mechanics, they cannot do better than get the one above referred to.

Farmyard Manure, its nature, composition, and treatment, by C. M. Aikman, M.A., etc. (London: William Blackwood & Sons). We think Prof. Aikman has done perfectly right in publishing this little brochure, which is in substance a chapter from the larger work he is preparing on soils and manures.

NOTES ON THE INFUSORIA.

By BERNARD THOMAS.

V.—HETEROTRICHOUS CILIATA.

IN this group some of the cilia are modified into hooks, styles or bristles, and are unevenly distributed over the body.

24. *Coleps hirtus* (Fig. 87), is about the five hundredth of an inch long. It is often found feeding on dead Entomostraca. Unlike the preceding ciliata, it is symmetrical; that is, the body might be divided by a longitudinal line into two halves. Another peculiarity of Coleps is the possession of a chitinous cell-wall, which can be seen separated from the protoplasm during division (Fig. 87, 3). In shape Coleps is oval, rounded behind, more truncate in front; sometimes it is somewhat pear-shaped, (Fig. 87, 2) at others separated into two halves by a more or less deep transverse constriction (Fig. 87).

The cell-wall is marked by strong longitudinal and transverse grooves, which go from end to end and

right round the body, like the lines of latitude and longitude on a globe. From these depressions the cilia appear to arise and there is also a small tuft of cilia at the anterior end, and one or two cilia spring

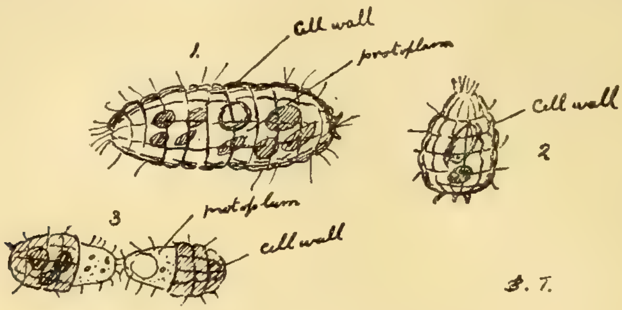

Fig. 87.—*Coleps hirtus*—1 and 2 highly magnified; 3, dividing.

from the posterior end, where there are three tiny hooks easily overlooked from their minuteness; they probably are modified cilia.

In the endosarc there are usually one or two round green or brown bodies, perhaps the food swallowed by this organism. There is also, often, a large,

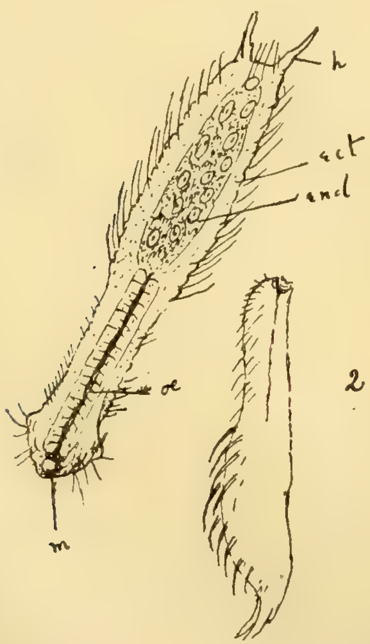

Fig. 88.—*Chætonotus larus*—1, front view 2, side view; *m*, mouth; *œ*, gullet; *end*, endosarc; *ect*, ectosarc; *h*. tail process. (Highly magnified)

highly refractive, colourless body near the centre. When fission takes place, the organism divides into two equal halves by a transverse constriction, each half thus separated developing a protoplasmic portion devoid at first of cell-wall, but furnished with cilia. It is interesting to note that this mode of asexual reproduction is similar to that observed in some Desmids (*e.g.* Cosmarium).

25. *Chætonotus larus* (Fig. 88) was placed by Ehrenberg among the Rotifera. Indeed its general appearance is suggestive of a higher place than among the Infusoria. Its size varies from about the seven hundredth to the two hundredth of an inch. Like Coleps, it is symmetrical, and the body is three or four times longer than broad; on the dorsal surface there are long bristles pointed backwards, and on the ventral or oral surface very minute cilia. It is an exceedingly rapid swimmer, and darts along, head foremost, so quickly that it is difficult to make out its structure. The anterior region or head is marked with one or two elevations, or tubercles, it is ciliated, and on the under-surface a round mouth may be seen furnished with movable lips. As the head moves about it is "telescoped" into the neck in much the same manner as is the head and tail of the Rotifer. The neck is thick and long, furnished with cilia, it passes, almost imperceptibly into a slightly broader body. At the posterior extremity there are two short, pointed processes, separated from each other by a short interval covered with cilia.

The outer layer of protoplasm is hyaline, and the granular inner substance is very clearly marked off from it. The mouth leads to a long œsophagus, traversing the neck, with transversely striated walls, and this ends in the inner substance. I have never discovered the nucleus. The terms endosarc and ectosarc are avoided, because it seems difficult to refer this very interesting organism to its true place in the animal kingdom; if it be one of the ciliata, it is probably the highest member of that series.

26. *Stylonichia mytellus* (Fig. 89) of Ehrenberg (*Kerona mytellus* of Dujardin) is from the two hundredth to the one hundreth of an inch long. It is heterotrichous, the cilia being of very different kinds. In the oral region, fringing the mouth, the cilia form a comb; posteriorly they are modified into styles, two of these point outwards at an angle with the body and a few between these point directly backwards and arise from the under-surface.

In Fig. 89, *j*, the posterior extremity is represented, and two large styles are seen.

Cilia can be modified into—1, *Flagella;* 2, *Retracting filament;* 3, *Setæ* or *bristles;* 4, *Styles;* 5, *Uncini* or *hooks*.

than the anterior part and with a small hooked process. From the anterior neck three or four cilia sprung (Fig. 89, *c*). In one case also I saw a similar, but not identical, organism attached near the posterior end of a mature Stylonichia (Fig. 89, *b*). In the

Fig. 89.—*a, Stylonichia mytellus; b, S. mytellus* with infusoria; *c*, larval forms, perhaps of *S. myteilus? d*, larval forms of Paramecium? *e, S. pustulata*; *f*, nucleus of *S. mytellus*, high power; *g*, contractile space diastole, *S. mytellus; h*, contractile space systole; *j*, posterior extremity, *S. mytellus; cs*, contractile space; *ch*, chlorophyll corpuscle; *m*, mouth; *s*, styles; *n*, nucleus; *a*, anterior; *p*, posterior end.

The *flagellum* and *retracting filament* have already been described. *Setæ* or *bristles* are strong straight filaments which are movable, but do not vibrate. *Styles* resemble them, but are thick with broad base. *Hooks* are curved, usually thick at the base, and short. It is said that the styles in Stylonichia are moved by the well-developed myophan layer. In the interior there are food vacuoles and only one contractile space. In the figure (Fig. 89, *g h*) the vesicle is seen in systole and diastole, surrounded by chlorophyll corpuscles. Once when examining this organism I found a curious little infusorian, which I thought might perhaps be a larval form. It was composed of faintly granular protoplasm, the posterior part of the body was devoid of cilia, broader illustration I have also figured what I take to be the larval Paramecium figured by Balbiani in the account he gave of conjugation in that organism.

In the last article the following corrections should be made:—*re* the reproduction of Paramecium, instead of "the young are described as acinctiform," read "the young are described as acinetiform;" *re* Spirostomum ambiguum, instead of "the arms (or anal area) terminal," read "the anus (or anal area) terminal."

(*To be continued.*)

We strongly recommend our readers who have the time not to miss an opportunity of visiting Mr. William Bull's Grand Annual Orchid Show at 536 King's Road, Chelsea.

A BOTANIST'S HOLIDAY IN THE PYRENEES.

[*Continued from p.* 135.]

NEXT day was Sunday, and was practically a day of rest, as I went by train round to Luchon in the department of Haute-Garonne, in the centre of the range, stopping a few hours on the way at the quaint old town of Monrejeau, where I saw in the principal street, on a good Sunday (Oh! shade of John Knox), a family playing cards. Luchon or Bagnères de Luchon, is a largish, and very fashionable resort, and seems to consist of hardly anything but hotels and lodging-houses. It is the best centre in the range for excursions, the middle portion of the Pyrenees being the highest. The situation is most picturesque, being apparently quite shut in on all sides by high mountains, though the part where it is built is quite flat. The following day after my arrival I set out to visit the Val du Lys, so-called, not from its lilies, but from an old or provincial form of the word "eau," water, from the number of its streams and waterfalls. The end of the valley is about seven miles from Luchon. The road passes up the valley through fields of maize for a short distance, then, as the valley narrows, through the woods; in about an hour the point where the road turns off to the right to enter the Val du Lys is reached, and in about another half-hour a fine open part of the valley, shut in at the end by wooded precipices, is reached. The upper end of the valley is very fine and looks quite inaccessible: above the wooded region appear the rocky peaks and glaciers of the Crabioules. On entering the valley I found *Digitalis lutea* (L.) in the woods, a species with cream-coloured, smallish flowers, and at the head of the valley, by the Cascade d'Enfer, the rare *Cardamine latifolia* (Wahl.), with its round lobed-leaves and rose-lilac flowers. At the small inn, or cabane, near the lowest waterfall, the carriage-road ends, but a good horse-road zigzags up through the steep woods to the Rue d'Enfer, a deep cleft in the slaty rock, filled up at one end with snow, under which the stream from the glaciers higher up comes rushing down. On the ascent through the woods I found *Mulgedium Plumieri* (DC.) something like a large glaucous *Sonchus arvensis*, with blue flowers, and much branched; *Geranium nodosum* (L.), a beautiful species with largish flowers of a light lilac veined with purple, and five-angled and lobed leaves; *Rubus glandulosus* (Bell.); *Ranunculus Gouani* (Willd.); *Epilobium montanum*, white-flowered; and, on wet rocks, *Hieracium neo-cerinthe* (Fr.), and *Saxifraga Clusii* (Gou.) (= *S. leucanthemifolia* (Lap.)), a species like *S. stellaris*, but larger, and very viscid, only three of the petals being spotted, the other two being smaller and unspotted. Higher up, above the region of the pines, near the Rue d'Enfer, the ground was carpeted with flowers. *Aconitum pyrenaicum* (DC.), a sub-species of *A. lycoctonum*, covered with yellow pubescence; *Aquilegia vulgaris*; *Stachys alpina* (L.); *Senecio adonidifolius* (Lois.); *Arnica montana* (L.), a composite with large orange-yellow heads; *Potentilla pyrenaica* (Ram.), very like *P. alpestris*; *Thalictrum aquilegifolium* (L.); *Senecio doronicum* (L.); *Euphorbia hiberna* (L.); *Crepis lampsanoides* (Froel.); *Dianthus barbatus* (L.); *Gnaphalium norvegicum* (Koch); *Hieracium pyrenaicum* (Jord.); and *Euphorbia angulata* (Jacq.), were the principal finds. The view above the Rue d'Enfer was magnificent: below was all the valley stretching away towards to Luchon, and the mountains around, while just beneath was a rocky chasm half filled with snow; a little higher up were the glaciers from which the stream flowed, and above all the bare and jagged mountain peaks against the blue sky. After climbing nearly to the foot of one of the glaciers, I was stopped by the descending mists, which suddenly came on, and I judged it wisest to return; so I made the best of my way down again, and in the evening got back safely to Luchon. Next day I had fixed for going by the Port de Venasque across the frontier into Spain, and returning by another pass, the Port de la Picade, a walk of about thirty miles, including an ascent of over 7000 feet from the altitude of Luchon (2063 feet). Starting at 6 a.m. from Luchon, and passing along the valley of the Pique in a south-eastward direction, past the Val du Lys, till the Hospice de France (or de Luchon), 6½ miles, was reached, I commenced the real ascent. At the Hospice, a substantially built stone inn, the last house in France on this route, the carriage-road ends, and the horse-road over the pass commences. From here to the summit of the pass is a good three hours' steady ascent among rocks, loose débris, and, higher up, over patches of snow. The surroundings are very wild and picturesque: jagged peaks, patches of snow, blue mountain tarns, and strings of Spanish mules with their ragged muleteers coming winding down the zigzag path, their bells making music in the solitude. The weather was all that could be desired, not a cloud in the blue sky, and just enough breeze to cool the heat from the sun's rays. At about an hour's walk from the Hospice the rareties commenced to appear: *Euphrasia minima* (Schleich); *Myosotis pyrenaica* (Pourr.), very like *M. alpestris*; *Arenaria ciliata* (L.); *Erysimum ochroleucum* (DC.); *Aquilegia pyrenaica* (DC.); *Gentiana nivalis* (L.); *Phyteuma hemisphæricum* (L.), a small species with linear leaves; *Saxifraga ajugæfolia* (L.); (by the stream) *S. aquatica* (Lap.); *S. capitata* (Lap.), intermediate between *S. ajugæfolia* and *S. aquatica*, and said to be a hybrid, and judging from their positions in this locality, not an unlikely supposition; *Senecio adonidifolius* (Lois.); *S. Tournefortii* (DC.); a species with lanceolate entire leaves; *Scleranthus uncinatus* (Schur.); *Paronychia polygonifolia* (DC.); *Silene rupestris* (L.); *Cardamine alpina* (L.), a very small species

with ovate entire leaves, and small white flowers; *Hutchinsia alpina* (R. Br.); *Armeria alpina* (Willd.), very like *A. maritima*, but with larger heads and flowers a brighter rose colour; *Linaria alpina* (L.); *Sisymbrium pinnatafidum* (DC.); *Oreochloa disticha*, a pretty little grass, like a Sesleria; *Luzula spadicea* (DC.), a common alpine species; *L. pediformis* (DC.), a rare plant, like a large *L. spicata; Veronica alpina* (L.); *Carex pyrenaica*, a little sedge, with a single spike of a brownish colour, and three stigmas to the fruit; and *Poa minor* (Gaud.).

After climbing for nearly three hours, the path appears to be about to end in a cul-de-sac of rocky precipice, when suddenly turning a corner to the left the Port de Venasque itself appears, a narrow opening in the rock-wall, at the summit of the ridge. The Port is only fourteen feet wide, and through this natural doorway, one passes from France into Spain, the boundary being marked by an iron cross. At this point, the first view of Spain bursts on the sight, a wild sea of barren rocky mountain tops, prominent among which, and only separated by the intervening valley d'Etangs, is the Maladetta, the monarch of the Pyrenees, (11,600 feet), which viewed from this point (8100 feet) does not appear very much higher: it is a huge mass of mountain, with glaciers near the summit and black peaks of rock sticking up here and there out of the snow and ice. The view on the Spanish side is much wilder and grander than that on the French one, the mountains being higher, more rocky, and barer. On the rocks in the Port, I found a densely glandular dark green little Saxifrage, *S. mixta* (Lap.) in very small quantity. A little way down the path on the Spanish side, there is a path leading to the right, up to the summit of the Pic de Sauvegarde, (9164 feet), from which may be seen what is said to be the finest view in the whole range. It is only an hour's walk from the Port, and having plenty of time, I decided to try it, and was amply repaid for the trouble by a truly magnificent view. I could see Luchon lying far below in the valley, and in the blue distance the plains of France stretching away as far as the eye could reach; immediately beneath were three deep indigo-blue mountain lakelets, whose waters sparkled in the bright sunlight. Turning round to the Spanish side, instead of the verdant valleys and plains of France, the picture of wild desolation forms a striking contrast, as the eye ranges over the bare mountains of Catalonia and Aragon, extending for miles away in the distance. After resting awhile at the top enjoying the view, and replenishing the inner man, I started to go down again, finding on the way *Leontodon pyrenaicus* (Gou.), *Asterocarpus sesamoides* (Gay), which grew in dense patches by the path; it is a small resedaceous plant, with a procumbent much-branched stem and densely-flowered spikes; *Veronica bellidioides* (L.); *Ranunculus pyreneus* (L.) a small plant with white flowers and linear leaves; *Angelica pyrenea* (Spr.), *Armeria alpina* (Willd.); and lastly an old Scotch friend, *Gnaphalium supinum*. Leaving the Port de Venasque to the west, the path leading to the Port de la Picade passes along the Spanish side of the ridge for about two miles, then turns north and crosses by another opening into France again, then going along the narrow edge of the ridge, here not above six feet wide, with precipices on both sides, it descends to the grassy Col de Mountjoie, almost the only large stretch of mountain pasture that I saw in the Pyrenees, in this respect differing greatly from the Alps. On the Col de Mountjoie I found *Carduus carlinoides* (Gou.); *Senecio adonidifolius* (Lois.); *Gentiana acaulis* (L.); *Festuca spadicea* (L.); *Gentiana lutea* (L.), the medicinal gentian, a large plant, three to five feet high, with whorls of yellow flowers, and large ribbed sessile leaves; and *Asphodelus albus* (L.), (Liliaceæ), with dense verbascum-like spikes of white flowers, and linear leaves. By the path down to the Hospice de Luchon (which by this route is approached from the upper end of the valley of the Picque, from which valley the path to the Port de Venasque goes off at a right angle), I found *Dianthus deltoides* (L.), var. *glaucus; Avena montana* (Vill.); *Biscutella lævigata* (L.), a crucifer with spectacle-shaped pods, and yellow flowers; *Genista sagittalis* (L.), a species with winged stems; and *Viola cornuta* (L.), with lilac-blue, long-spurred flowers, and cordate leaves, not unlike *V. lutea*, var. *amœna*, in habit and size of flowers. By the time I reached the Hospice it was about 7 p.m., and I was getting pretty tired, and so did not trouble about looking out on the way back to Luchon, where I arrived a little after 9 p.m. well satisfied with the day's work. The next day was to be the last one in the Pyrenees, and I decided to go to see the Lac d'Oo, a small lake up in the mountains, ten miles from Luchon. The day proved very hot, and being tired with the previous day's walk, I did not get there till about 3 p.m. The first six miles, as far as the village of Oo, is pretty, but not very striking; the road passes through several villages, but after passing the village of Oo, it enters the Val d'Oo, a very fine one, with the snow peaks near the Port de Venasqne at the head of it. Three miles up this valley the road ends, and a path winds up a steep slope, through a pine-wood, till at the top of a kind of dam across the valley, one reaches the Lac d'Oo, a most beautiful lake surrounded by frowning precipices, and with a fine waterfall 800 feet high at the head, and scattered pines clothing the ledges of the rocks. On the way up to the lake I found *Meconopsis cambrica* (Vig.); *Reseda glauca* (L.); *Cochlearia pyrenaica* (DC.), a sub-species of *C. officinalis; Sisymbrium acutangulum* (DC.); and *Campanula patula* (L.), this last not uncommon in the hedges all through the part I visited. Above the lake grew the Pyrenean iris in plenty; *Asphodelus albus* (L.), here on account of the lower elevation,

about 3000 feet, gone to fruit; *Crepis lampsanoides* (Froel.). After spending a short time by the lake, I strolled quietly back to Luchon, and so ended my last day in the Pyrenees. Next morning early I took train for Bordeaux viâ Tarbes and Mont Marsan, and from thence returned through Paris to Liverpool, having had a most enjoyable holiday. Now, if anyone, induced by these few notes, be tempted to take a holiday in the Pyrenees, I am certain they will not regret it; the scenery is lovely, the people and places interesting, charges moderate, and as far as my experience of the weather went, it could hardly have been improved on; lastly the botanist will find a mine of wealth to work at, which will take him some time to exhaust, and will afford him, I am sure, a most enjoyable botanist's holiday in the Pyrenees.

A. E. LOMAX.

THE FLORA OF THE BANKS.

THE locality known as the Banks is pleasantly situated near the river Ribble. Starting from Clitheroe railway station, we go along the road leading to Waddington until near Brungerley Bridge, then turn to the left along the footpath over Knunck Knowles, noticing the pretty flowers of the vernal whitlow grass (*D. vulgaris*) which are very abundant.

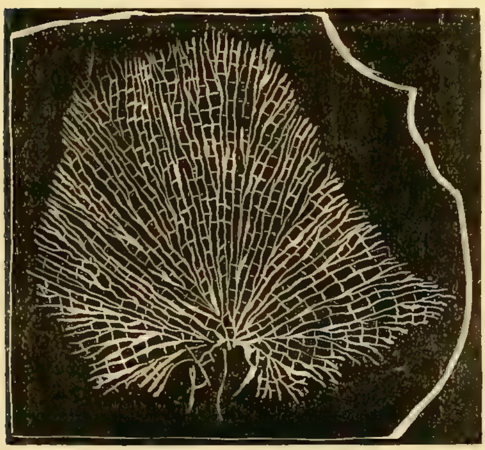

Fig. 90.—*Fenestella plebeia.*

Behind the hill I have seen the barren blade of the adder's tongue (*O. vulgatum*) but have not succeeded in getting the fertile spike in this locality. From here we are soon on the top of the quarry, and with another step we are in the Banks. It is a pretty place consisting of miniature hills and dales caused by quarrying operations in former years. These during four months are carpeted with treasures of the floral world. Standing on one of these hills the view is fine, green fields and pretty woodlands stretching from the bank of the river, away to a long line of moorland.

Referring to page 14, "Geology of the Burnley Coal-field," I find: "The Carboniferous limestone of the Clitheroe anticlinal is concealed or very obscure all along the northern border, and the many folds into which it has been thrown, have rendered its boundaries difficult to map with accuracy. On the south of the arch, however, we have a succession

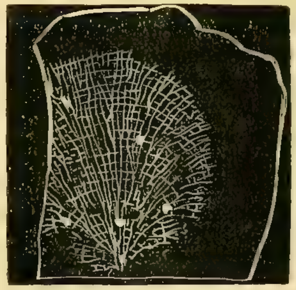

Fig. 91.—*Fenestella nodulosa.*

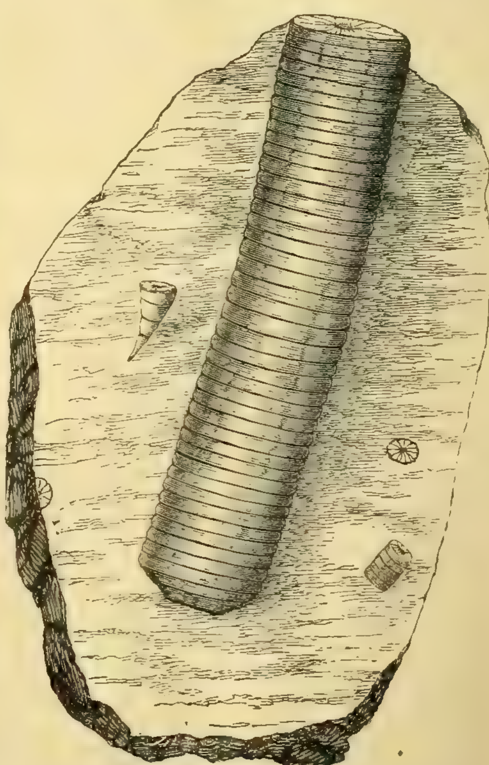

Fig. 92.—Common Encrinite (*Poteriocrinus crassus*).

of very good rock exposures, which afford facilities for its study. It contains two very distinct members. The lower consists of very black and pure bituminous limestone, and sometimes contains beds of black calcareous shale. It is almost always very distinctly and evenly bedded, and forms in its range a very straight and very well-marked ridge, which com-

mences at Horrocksford quarries, and continues in an east-north-easterly direction by Ridding Hey and Bold Venture Limeworks and then along the north side of Downham Hall demesne and Twiston lane to the old lead-mines at Skelhorn or Skeleron. Immediately above the Black Limestone is a band of shales containing fossils, of which *Fenestellæ* are the most abundant. The shales at Knunck Knowles by the road cutting going down to Brungerley Bridge near Clitheroe are probably the same."

On the top of the quarry *Ranunculus repens*, *ficaria*, and *bulbosus*, *Bellis perennis*, *Cerastium vulgatum*, *Tussilago farfara*, *Senecio vulgaris*, *Stellaria media*, *Potentilla anserina*, *Anagallis arvensis*; in 1887 I gathered a specimen of *Erysimum orientale*. Leaving the quarry, we enter the Banks, and can wander at our own will among the hills and dales, noticing the bright yellow flowers of the mouse-ear hawkweed (*Hieracium pilosella*), *Primula vulgaris* and *veris*, *Leontodon hispidus*, *Taraxacum officinale*, *Ajuga reptans*, *Polygala vulgaris*, *Veronica chamædrys*, *Alchemilla vulgaris*, *Saxifraga tridactylites*, *Tri-*

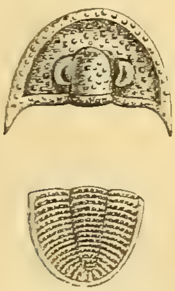

Fig. 93.—Trilobite (Phillipsia). (All these are very common fossils near Clitheroe.)

folium pratense-repens, *Potentilla tormentilla*, *reptans*, *Lotus corniculatus*, *Bunium flexuosum*, *Chrysanthemum leucanthemum*, *Plantago lanceolata*, *media*, *major*, *Achillea millefolium*, *Chærophyllum temelum*, *Rosa canina*, *arvense*, *Arabis hirsuta*, *Prunella vulgaris*, *Medicago lupulina*, *Linum catharticum*, *Euphrasia officinalis*, *Viburnum opulus*, *Lamium maculatum*, *Senecio jacobæa*, *Heracleum sphondylium*, *Pimpinella saxifraga*, *magna*, *Poterium sanguisorba*, *Thymus serpyllus*, *Centaurea nigra*, *Campanula rotundifolia*, *Calamintha clinopodium*, *Anthyllus vulneraria*, *Galium verum*, *Agrimonia eupatoria*, *Origanum vulgare*, *Matricaria inodora*, *Ononis arvensis*, *Scabiosa arvense*, *succisa*, *Gentiania amarella*, *Arenaria Serpyllifolia*, *Erigeron acris*, *Lychnis dioica*, *Stachys betonica*, *Fraxinus excelsior*, *Cratægeus oxyacantha*, *Ribes grossularia*, *Reseda luteola*, *Myosotis arvense*. Returning the lower way to Brungerley Bridge, the sloe (*Prunus spinosa*) is very abundant in the hedge; in a swamp near the river we notice the bright golden balls of the globe-flower (*Trollius Europeus*), *Cardamine pratensis*, *Ranunculus flamula*. Among the waste material at the foot of the quarry there is *Viola hirta*, a very rare species in this district, *Cnicus lanceolatus*, *arvensis*, *Potentilla fragariastrum*, *Fragaria vesca*, *Asperula odorata*; on the river bank, *Cochlearia officinalis*. In another swamp at the other end of the quarry there are a few plants of *Menyanthes trifoliata*, *Œnanthe crocata*; still keeping close to the river a few plants of *Lathyrus macrorhizus*, *Myrrhis odorata*, *Lysimachia nemorum* and *Scilla nutans* may be noticed.
—*M. Demain.*

MINUTE ARCELLÆ.

ASSOCIATED with the Hedriocystis described by me in a previous paper, I obtained the minute organisms figured in A and B, and in profile in C. In A I have represented the normal appearance under a $\frac{1}{16}$-inch w.i. of this Rhizopod; in B the details brought out by using roseine as a stain. The organism glides almost imperceptibly along the slide, or the cover-glass, and generally, though not always, without the emission beyond its periphery of any pseudopodia. Its carapace is hyaline, and only faintly takes up the stain I used. It has no hexagonal, punctate, or other markings; is apparently structureless; and is slightly folded in on its under-

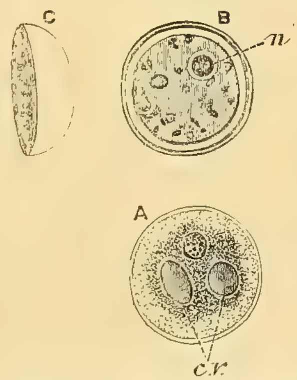

Fig. 94.—A, living organism; B, stained and killed with roseine; C, side view of organism.

surface as represented in B and C. This fold is best brought out in stained specimens. I have only in two or three instances found faint blunted pseudopodia projected beyond the margin of the carapace, and having regard to the great number of these forms which I have had under observation, this percentage would be very small. The carapace varies in diameter from about $\frac{1}{1300}$-inch to $\frac{1}{1600}$-inch, while an average Arcella taken at random from the same water measured $\frac{1}{430}$-inch. The abundance of the organism coupled with its association with the stalked Actinophryans recently described by me, and its minuteness are my reasons for recording this note.

W. J. SIMMONS.

Calcutta.

SOME FAMOUS COLLECTING GROUNDS FOR DRAGON-FLIES.

By the Author of "An Illustrated Handbook of British Dragon-flies," "A Label List of British Dragon-flies," etc., etc.

V.—THE ENGLISH LAKE DISTRICT.

THE best hunting-ground for dragon-flies in the North of England is undoubtedly the Lake District of Cumberland and Westmoreland. Here we may meet with these grand insects in all their glory, combined with the most charming and diversified scenery.

Ambleside, which is situated at the top end of the beautiful expanse of Windermere, will be found a very convenient place where to fix our headquarters, as it is in the centre of this delightful district. From hence we may make short expeditions to Lakes north, south, east and west with great facility.

The following is a list of the various kinds of dragon-flies which may be met with in this far-famed district of mountain, lake and stream: *Platetrum depressum* (not uncommon). *Leptetrum quadrimaculata* (common). *Orthetrum cærulescens* (local and scarce). *Leucorrhinia dubia* (on extensive moors in the north of England,* but very local). *Sympetrum vulgatum* (abundant). *S. flaveolum* (local). *S. scoticum* (plentiful). *Cordulia ænea* (very local; has been taken at Windermere). *Cordulegaster annulatus* (abundant on all streams). *Brachytron pratense* (doubtful). *Æschna juncea* (not uncommon). *Æ. cyanea* (ditto). *Æ. grandis* (local). *Calopteryx virgo* (abundant). *C. splendens* (ditto). *Lestes sponsa* (local). *Platycnemis pennipes* (ditto). *Enallagma cyathigerum* (abundant; on August 1st, 1887, I met with this species in immense numbers at Windermere; they were probably a second brood, produced by the abnormal heat and fine weather of the summer of that season). *Agrion pulchellum* (doubtful). *A. puella* (abundant). *Ischnura elegans* (common). *Pyrrhosoma minium* (plentiful).

The preceding is a very meagre list of the Odonata of the English Lake District, which is accounted for by the fact that it has been so little explored by collectors of these beautiful insects. There is no doubt that anyone who would assiduously apply himself to the task could easily add several species to the dragon-fly fauna of the delightful domain in question. Among the lakes and mountains of Cumberland and Westmoreland there ought to be several good species yet to be discovered which have hitherto remained unrecorded.

VI.—THE SCOTCH LAKE DISTRICT.

To those dragon-fly hunters whose intention it is to spend their holidays in the Highland Lake District this summer, the following information may not prove unacceptable.

The best locality in this extensive area is at Rannock, in Perthshire, where two species are found, namely, *Somatochlora metallica*, and *Æschna borealis*, which occur nowhere else in the British Isles. Both of these beautiful insects will be found fully described in my little work entitled "An Illustrated Handbook of British Dragon-flies," which has been previously alluded to.

In addition to the above two rare and local species, the following may be found in the Scotch Lake District: *Platetrum depressum* (rare). *Leptetrum quadrimaculata* (abundant). *Orthetrum cærulescens* (very local). *Sympetrum vulgatum* (plentiful). *S. flaveolum* (very local, but usually abounds wherever it occurs).* *S. scoticum* (abundant everywhere). *Cordulegaster annulatus* (frequents all the mountain brooks and streams). *Brachytron pratense* (very local). *Æschna mixta* (occurs in Scotland on the authority of Dr. Hagen). *Æschna juncea* (abundant everywhere). *Æ. cyanea* (rare and local). *Æ. grandis* (ditto). *Calopteryx virgo* (common, but local). *C. splendens* (ditto). *Lestes sponsa* (common). *Platycnemis pennipes* (common, but very local). *Enallagma cyathigerum* (very plentiful). *Agrion pulchellum* (very local). *A. puella* (common). *Ischnura pumilio* (very local and rare). *I. elegans* (plentiful). *Pyrrhosoma minium* (abundant).

The number of species of dragon-flies, hitherto recorded as occurring in Scotland, is twenty-four, but there is no doubt that after a little exploration and investigation this number could be increased. Several species which have been known to occur in the north of England, have at present not been found in North Britain, so there is plenty of scope for those who wish to add to the list of the Odonata of the latter country.

* *Vide* my "Illustrated Handbook of British Dragon-flies."

* *Vide* my "Illustrated Handbook of British Dragon-flies."

A FEW REMARKS BY AN UNSCIENTIFIC OBSERVER UPON VEGETABLE TERATOLOGY.

I HAVE been much interested in papers discussing "Vegetable Teratology" during the last three years in SCIENCE GOSSIP. From the vari discussions on the subject, I take it to be the prevalent scientific idea that plants showing any vagaries and abnormal methods of growth are endeavouring to return more or less to a primitive form.

How many of the scientific writers have examined carefully into the position, health and surroundings of those plants supposed to be discontentedly reaching back to their ancestors? I think those who do so will find in almost every case a more simple and natural reason for the curious deformities so often found.

In wild flowers, I have on strict examination scarcely ever failed to detect the cause to be the work of some small insect, often the eggs of a tiny fly, which, in laying them, burrowed into the plant; not always close to the monstrosity, but rendering the plant unhealthy. An accidental cut with a spade at the base of the stem will often cause abnormal growth.

A very large number of my back numbers of SCIENCE GOSSIP were burnt accidentally last summer, so I am unable to state the date of the number in which there was a beautifully-executed illustration of a cabbage-leaf, which had fashioned itself into something like the shape of an old-fashioned champagne glass. There was, to the best of my recollection, a slight idea put forward that the progenitors might have been some of the cup-bearing plants of South America.

Allow me to give you the history of a bed of cauliflowers in my own garden. The ground was prepared as usual and the plants set, when the gardener showed me some half-dozen left over, and informed me that they were all very "poor plants," pointing out a small wart about the size of a pea on the root of each close to where the stalk started; he proceeded to pull off the wart, and show me a small insect inside, and finished by giving me the pleasing information that every plant he had put down had the same; but assuring me he had constantly "seen the like," and it was "no harm." When the time for cutting cauliflowers came, it would have puzzled anyone to pick out to what primitive type they were retrogressing, as not one of them presented the same appearance, or resembled a respectable cauliflower plant. Four or five of them were long-stalked plants, with a bunch of small leaves at the top, and soon withered away without any appearance of flowers; others were short and stout, with a cauliflower the size of a walnut at the base of each leaf; one outgrew all the others, and developed leaves more than two feet long, one of the outside leaves being similar to the illustration in SCIENCE GOSSIP—a large funnel-shaped monstrosity—but no attempt at a flower. The whole plot produced but a couple of cauliflowers, and those half-diseased and unfit for use; had I not seen the insect mischief at the root, the abnormal growth would have been a mystery to me; as it was, I could attribute it to nothing else.

I have seen a whole row of auriculas, with fasciculated stems produced by over manuring. They belonged to an old gentleman who was devoted to them, and he fed them so assiduously that the flower-stems at last reached the dimensions of nearly an inch across, flat and striated, with very crowded heads of very small blossoms, curiously distorted.

A young rose-tree in my garden, during two seasons a healthy and stalwart bloomer, began in the third to produce small bunches of leaves in the middle of the blossoms, and many other eccentricities, and continued to do so the following year; it was pruned and doctored, but to no purpose. It occurred to me that perhaps it wanted more air, as I had set other plants quite close to it. These were removed, and from that out there were no more sprouts of green leaves in the blossoms, no buds half leaf half corolla, etc., etc.

In wild plants it is of course far more difficult to account for abnormal growth, but it can be discovered in most cases by close scrutiny, so as to warrant the belief that such growth is always caused by some insect or other damage.

I have found several times patches of the common birdseye growing in a way sufficiently different to the usual habit to attract attention, with softer and more downy leaves, and a larger and more straggling growth; at first I could see nothing to account for it, and thought it was a variety. However, after many attempts I found the difference was caused by minute soft protuberances here and there on the plant, generally at the base of a leaf-stalk, locking quite like a part of the stalk's growth; but on opening them there was to be seen the reason for the unusual form of the plant, a bunch of minute eggs, or the insects just ready to emerge.

I. G.

EXPERIMENTAL SECTION OF HYDRA.

HYDRA VIRIDIS.—Baker's Binocular, $1\frac{1}{2}$ in. A eye-piece. The Hydra was divided in the live-box in which it had been living for three days. It was apparently in good health. The section was performed with a sharp, curved knife, and at the site of junction of "head" and body. In the same live-box were Cypris, Cyclops, Vorticellæ, Daphnia and Duckweed. The experiment began on March 27th, 1892. Before division the Hydra had eight processes.

1.40 *p.m.*—Firmly fixed; stump actively contracting and extending.

Tentacles moving actively; no attempt at fixation; $3\frac{1}{2}$ tentacles have disappeared.

2.30 *p.m.*—Apparently one arm is fixing cephalic fragment to the trough; the other arms are moving actively.

The body is swaying about and extending with great vigour.

3.30 *p.m.*—No alteration in body, A cyclops became motionless for a while after contact; the cephalic fragment is now free, and moves very actively. One of the tentacles has been apparently wounded in process of section; it is swollen and twisted, and is not nearly so active as are the others.

6 *p.m.*—During the last $2\frac{1}{2}$ hours but very slight alteration has taken place. The cephalic fragment is unchanged; the tentacles (or stumps) on the body seem a little longer. The only noteworthy point is that a swelling has developed at the junction of the

middle and lower third of the body. This I take to be traumatic, as it is symmetrical.

9 *p.m.*—The microscope having been in darkness since the last observation, the point as to whether any details of interest would occur on exhibition of artificial light was now investigated. The two fragments were known to be separated by 1¼ inches. By means of a pin-hole diaphragm a pencil of light was suddenly projected on to the body. It was seen to be in a state of moderate contraction, but absolutely motionless; and although the light was continued on it for 1½ minutes, no movements occurred. By gently moving the mechanical stage, I now placed the cephalic fragment in the field. As it approached the centre it was seen to be absolutely quiet, but instantly it arrived in the central bright spot active contractions occurred. The body was again brought under the influence of light and left there, and it was not till a Cyclops came hurrying by that any contractions took place. As a control experiment, a budding *Hydra v.* in the same trough was treated in a similar way. Active contractions occurred in the parent at once, but not till some time had elapsed in the budding Hydra. As regards the condition of the two fragments, practically no alteration has taken place; perhaps the swelling on the body is not quite so large.

March 28th, 10 *a.m.*—This morning the fragments were found to occupy the same position as on the previous evening. The cephalic fragment is certainly less active, and shows no signs of fixation to glass or débris at the bottom of the trough. The body, on the other hand, is firmly fixed, and very active. The tentacles certainly appear longer; the swelling, too, has disappeared. I think this proves that it was only the effect of injury.

5 *p.m.*—Body active: arms certainly longer. A foreign body is to be made out in the alimentary canal, which was not there this morning. As the Hydra is on the distal side of the box I cannot get any power higher than ⅜ to bear on it; but from the outline it looks like a small Cyclops. Anyhow there is something in the alimentary canal, and the probability of its being food I should think was great. As for the cephalic fragment, it is shrunken up, only extending and contracting at different intervals. It shows no sign of active growth, but the wounded tentacle is longer and straighter.

10 *p.m.*—The experiment of stimulation with light was repeated to-night with practically the same result. The body did not respond at all to the stimulus, whilst the head did, certainly not so strongly. I fear it will not live long.

March 29th, 11 *a.m.*—On examining the contents of the live-box this morning no Hydra, or at any rate, no divided Hydra, was to be seen. Nor was the body found, although I made observations for the two succeeding days, and on the third examined every few drops contained in the trough in a "pond" slide. Nor was it to be found adhering to any

Fig. 95.—Body (1.40 p.m.)

Fig. 96.—Cephalic fragment.

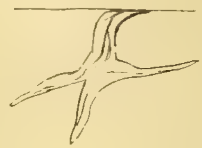

Fig. 97.—(2.30 p.m.)

Fig. 98.

Fig. 99.—(6 p.m.)

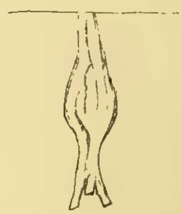

Fig. 100.—(9 p.m.)

Fig. 101.—(March 28th.)

Fig. 102.

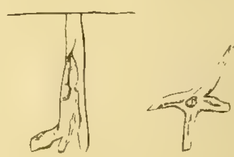

Fig. 103.

duckweed. The only explanation I could offer was that it had been devoured by a Cypris; thus turning the tables on the decapitated Hydra. The cephalic extremity is shrunken to a mere speck, and evidently dead. I have never known a Cypris devour a Hydra before, but taking into consideration the weakened state of the polype, I see no season why any other explanation should be sought for the disappearance of the subject of the experiment. It had certainly gone from the live-box.

The chief point of interest in the experiment is, I think, the effect of light on the two fragments. Of course one knows that there are many more hematocysts on the tentacles than on the body, but one has always considered that their purpose was specially that of paralysing prey seized. Whether the smaller * capsules mentioned by some authorities are in any way concerned in the reception of external stimuli would, I take it, be mere speculation. Anyhow, it is evident that the tentacles are more easily stimulated than the body, and it is chiefly with the object of noting this fact I have ventured to send in the record of this experiment, unfortunately brought to an abrupt termination, to the readers of SCIENCE-GOSSIP.

HERBERT J. FREDERICK, L.S.A.

Sidcup.

SWISS BOTANY.

AN old botanist wishes to draw attention to the country round Vevey as a most interesting and prolific collecting-ground, and one not much resorted to.

In early spring, long before the higher pastures are accessible, the meadows about Blonay are carpeted with the poetic narcissus and tufts of the beautiful *Fumaria densifolia*; every little rock peeping up through these hilly meadows is decked with the red, white, or blue *Vinca minor*, sometimes all three growing together.

In damp woody places near Jilamont, the lily of the valley is plentiful. The vineyards are full of various species of hyacinth: the grape hyacinth perfuming the whole country where the vineyards, bathed in the sun, slope down to the lake. The feather hyacinth, and many other curious and rare plants, grow amongst the vines, and round the edges of the vineyards a great variety of linaria.

In the woods on Mont Chardon is found the *Cypripedium calceolus*, the lady's-slipper.

The hill rising behind Blonay, the Pleiades, is nexhaustible in its variety of botanical treasures —*Myosotis rupicola* and *alpina* amongst others being plentiful—and in the little marshy spots formed at intervals by the rills running down the mountain side, there is a rich and beautiful harvest to be gathered.

In the valley behind Villa Jilamont, and running parallel to the Freiburg Road, the steep river-banks on either side are full of a great variety of orchidaceous plants, and also a small variety of the *Anthericum liliastrum*; and on the higher ground between Jilamont and Maison Lavade may be found the spider and fly orchids in considerable quantity. I several times found the *Epipactis latifolia*, the *E. grandifolia* and the pink Epipactis all growing together in the woods.

I have never myself collected in the marshy places at the head of the lake, but they are known to be homes of many botanical treasures.

The "Dent de Jaman" is another delightful place for a day's botanizing. Besides the variety of gentians (amongst them the medical gentian), there are many plants not usually found so low down on the mountains, and close under the mass of rock forming the "Dent," amongst the débris are to be found the sweet-scented cyclamen, and sparingly, the Rose des Alpes. On the roadsides, where it seems to love the dust, a sweet perfume leads one to the pretty *Dianthus Gallicus*.

Anyone who wishes for a more distant ramble can cross the lake and climb one of the mountain paths close to the bridge that marks the Piedmontese frontier, and there find the *Aquilegia alpina* and the curious yellow monkshood, looked on with terror by the peasants as the most poisonous plant in existence. They used to tell awful stories of tourists being poisoned by carrying bunches of it in their hands.

I have given but a very faint sketch of the advantages of Vevey for collecting purposes, and I hope some botanist will try it this year, and give us his experiences. I have never seen noticed the distinct difference between the Swiss and Italian *Ophrys apifera* and ours. Independently of the much larger size of the foreign plant, there is a very marked difference in the form of the blossom. The middle segment of the calyx, which in the English apifera is always bent back so as to be little visible in the front, in the Swiss and Italian flower stands upright and often bends slightly over the lip when in full blossom, the small triangular petals are much larger in proportion, and the green bands on the pink sepals more pronounced; added to which, the foreign plant has a very disagreeable smell, not the flower alone, but the whole plant, which is not the case with ours; also, the foreign plant is generally found in marshy places, while ours loves dry, chalky downs.

I. G.

SCIENCE-GOSSIP.

A NEW and ingenious instrument has just been invented for roughly indicating the amount of dust in the atmosphere. It is called the Koniscope. It consists of an air-pump and a tube provided with glass ends. The dusty air to be tested is drawn into

* Griffith and Henfrey.

the tube, where it is moistened and expanded. The depth of colour seen on looking through the tube indicates the degree of impurity in the air. It takes an immense number of particles of dust to produce any visible colour. Thus, 80,000 per cubic centimetre only produce a very faint tint. It requires one million and a half of dust particles to give the air a fine blue colour, and four millions of such to produce a dark blue. By means of this instrument it is easy to trace the pollution taking place in rooms, as well as the pure and impure currents of air.

ENTOMOLOGISTS have this year been much concerned with the influences of temperature on the development of insect life. The days have recently been brilliantly sunshiny and hot, but there has seldom been a night without a frost. In consequence butterflies have been very plentiful, and moths comparatively scarce. Easterly winds, with frost at night, are injurious to moths, but do not appear to affect butterflies so long as there is plenty of sunshine and blue sky.

IT can hardly be wondered at that our chief scientific journals feel a trifle bitter at the manner in which the University of Cambridge has conferred honorary degrees on the occasion of the installation of the new Duke of Devonshire as Chancellor. *Nature* remarks that "culture, and especially scientific culture, goes for very little among the classes of distinction recognised by the university. Eminence in the political world and in society, seems to be the claim chiefly recognised."

IN the United States the naval people are now concerned with experiments on armour plates 10½ in. thick. Some are all steel, some nickel steel. Is the world's available supply of iron to be used up in this stupid manner? The nickel steel, we are told, proved the best defence. But why should defence be required, unless you have nations who want to attack? An attacking nation is an international burglar, and ought to be handled by the scruff of the neck, as you would your neighbour's cat when it disturbs your rest.

TRANSACTIONS of the Guernsey Society of Natural Science and Local Research for 1891 contain the following papers:—"The Flora of Guernsey," by Mr. E. D. Marquand; "On Mica Trap Dykes in the Channel Islands," by the Rev. E. Hill, F.G.S.; "A List of the Neuroptera inhabitating the Island of Guernsey," by Mr. W. A. Luff, etc.

WE have received a copy of the Transactions of the Burton-on-Trent Natural History and Archæological Society, containing the following papers:—"The Lepidoptera of Burton-on-Trent and neighbourhood," Part II., Micro-Lepidoptera "compiled by J. T. Harris, F.E.S., and Philip B. Mason, M.R.C.S., etc.; "The Functions of a Local Natural History Society, with Special Reference to the Study of Plant Galls," by Philip B. Mason, M.R.C.S., etc.; "Some Varieties of Huskless Barley from Thibet," by Horace T. Brown, F.R.S., etc.; "The Irish Aran," (with seven plates) by Philip B. Mason, M.R.C.S., etc.; "Notes on a Salt-Marsh at Branston," (with one plate), by J. E. Nowers and J. I. Wells; "Trout and Grayling," by G. Morland Day; "Notes on a Summer Tour in Norway," by Horace T. Brown, F.G.S., etc.; "Some Ancient Burton Manuscripts," by T. Knowles, M.A., etc.

WE are pleased to draw attention to a cleverly written essay, bearing on Systemisation, published by Williams and Norgate, entitled, "The Organisation of Science." It is cleverly written, and bristles with numerous points of scientific interest.

THE report for 1892 of the "Parents' National Education Union" is well worth reading. We know of no other educational association that is doing better work for the present generation, or more work for the generation to come. It has been the dream of educationalists that some day or other education might grow into a possible science. Could there be a science of greater importance? Miss C. M. Mason of Ambleside has to be credited with splendid work done in this direction.

THANK Heaven, bread is cheap. In a new book just published by Dr. Goodfellow, on "The Dietetic Value of Bread," the author gives his reasons for holding that the ordinary wholemeal bread is not a desirable food, and that it is much inferior to good white bread as regards the weight of actual nourishment, and the thoroughness of the diet. White bread, he says, is one of the cheapest foods, not only with regard to the actual weight of nourishment obtained from it, but also with regard to the variety of nutrient constituents it contains. A purchaser who spends 2½*d.* on a two-pound loaf cannot spend his money to better advantage.

THE juvenile and too accurate reporter stated of a shower which fell at a horticultural fête, that "the drops varied in size from a shilling to eighteenpence." Mr. E. J. Lowe, the well-known meteorologist, has recently shown that the sizes of raindrops do vary very considerably. He made 300 sketches of them. Sheets of slate in a book form, which could be instantly closed, were employed. These were ruled in inch squares, and after exposure the drops were copied on sheets of paper ruled like slates. Some drops produce a wet circular spot, while others, falling with great force, have splashes around the drops. The same-sized drop varies considerably in the amount of water it contains. The size of drop ranges from an almost invisible point to one of 2 in. diameter. Occasionally large drops fall which must be more or less hollow, as they fail to wet the whole

surface inclosed within the drop. Besides the ordinary raindrops, Mr. Lowe exhibited diagrams showing the drops produced by a mist floating along the ground; and also the manner in which snow-flakes, on melting, wet the slates.

We are pleased to note that Dr. John Evans, F.R.S., etc., the distinguished archæologist, etc., has been made K.C.B. Science is looking up.

The Second Annual Exhibition of the Field Naturalists' Society of New South Wales, was held recently. This Society was formed two years ago, and during that time has carried out a number of excursions, intended to assist those who were studying certain branches of science. A great number of exhibits were received, so that the hall had been converted into a very attractive museum. A collection of shells sent by Mrs. G. J. Waterhouse, were amongst the most beautiful of the displays, being representatives of Fiji, Mauritius, and Australia. The exhibition was opened by Mr. J. H. Maiden, F.L.S., and microscopic slides were exhibited, with the aid of the oxyhydrogen microscope, by Mr. W. J. J. Mundy, and a lecture, "A Marine Excursion by Limelight," was given by Mr. Cyril Haviland, illustrated by photographic transparencies. Among other exhibitors were Messrs. A. Sidney Olliff, E. P. Ramsey, LL.D., F.R.S.E., F. A. A. Skuse, Thos. Whitelegge, F.R.M.S., etc., etc.

Those who find themselves at Eastbourne during July, August, and September, should visit the Devonshire Park, to inspect the "Tanganyika Exhibition," and hear the demonstrations of Captain Hore, the brave missionary who for eleven years lived and worked on and about the shores of the lake. The natural history specimens are very interesting.

We are very pleased to draw attention to the "Supplement to the Third Edition of English Botany," (uniform with the latest edition of Sowerby). This supplement has been in preparation for several years, and four parts are ready for immediate issue. Mr. N. E. Brown, of the Royal Herbarium, Kew, has carried it as far as "Dipsaceæ." The continuation and further revision has been undertaken by Mr. Arthur Bennett, whose name is sufficiently well-known to English botanists to guarantee the satisfactory completion of the work. The third and last edition of "English Botany" was published 1863–1872. Since the date of its completion, many new facts of importance, and the general increase of knowledge of the science of botany have necessarily made it advisable to once more bring the work fully up to date; hence the reason of this new volume.

There is hardly a disease to which humanity is heir with so ominously sounding a name as cancer. Is it an organism growing like a fungus, or merely an abnormal growth of tissue? The natural history of cancer is as yet little understood. Investigation strongly suggests it is something of a fungoid growth; or rather that the abnormally-formed tissues are due to the presence therein of some specific organism. An eminent Austrian physiologist has been operating on canceroid growths by injecting alcohol into their circulation. He has just published an account of his experiments, which appear to have been mostly successful, although time and patience are required by the process.

If water-power is to be used in generating electricity, it is natural that cataracts should suggest themselves, and, of course, the Niagara first of all. The utilisation of the mighty energy of the latter, now entirely wasted, has been talked of, speculated about, and almost "boomed" for several years past. Mr. Tesla's recent discovery of generating swift, alternating currents promises to throw a new and practical light on the subject. A Niagara Cataract Construction Company is in existence. Mr. Forbes, the well-known electrician, is at the falls, and suggests the employment of Tesla's alternating currents to utilise the power, with the same kind of motor as that employed by him. The power is to be transmitted to Buffalo, there to be split up and used for lighting electric tramcars, etc. This is probably the beginning of a new era in mechanics. The old-fashioned water-mills utilised the force of running streams with such rude machinery as was available—the miller's water-wheel is the veritable ancestor of the Niagara electro-motor.

Is there a defect of the human countenance better known than the popular "squint," which is practically due to the fact that one or more of the muscles which ought to adjust and focus the eye are defective? Some oculists devote special attention to this subject, for "squinting" most frequently occurs when people have otherwise beautiful eyes. Dr. Stevens has been studying the changes of these muscles by the aid of photography, and he has taken 2000 portraits of people so affected. In the majority of cases careful observations have been repeated many times over, and photographs taken at various stages of modification of the muscles of the eye, so that a comparative study of the human face under their varying conditions is now possible. The result of Dr. Stevens' investigations is to demonstrate that certain well-defined types of facial expression are both associated with and dependent upon certain relative tensions of the muscles of the eyes, which latter movements are, of course, intended to adjust the eyes for accurate sight, as you would in focussing an opera-glass.

This is the time of year when even botanists take holidays. To such who have not made up their minds to go, we would strongly recommend the brochure of our earnest and valuable contributor,

Mr. E. D. Marquand, "The Flora of Guernsey," reprinted from the transactions of the Guernsey Society of Natural Science, for 1891.

THE last number of the "Essex Naturalist" for May includes, in addition to the account of the ordinary meeting, the following valuable articles: "Notes, Original and Selected;" "Ancient Remains at Epping, Essex," by C. B. Sworder; "Epping Forest Rubi," by J. T. Powell; "Notes of Two Days' Trawling and Dredging in the River Crouch," October 10th and 15th, 1891, by Walter Crouch, F.Z.S.

WE are very pleased to call the attention of our botanical and microscopical readers to No. 9 of M. Tempère's "Le Diatomiste" (London: H. P. Collins), perhaps the best work on Diatoms yet issued.

THE amiable Professor James Thompson, brother of Sir William (now Lord Kelvin, a new invention, that is a "scientific peer," created as such), has just died.

WE strongly advise our readers to carefully and enjoyably peruse the Report of Professor Percy Frankland's Lecture at the Royal Institution on "Micro-Organisms in their Relation to Chemical Change," published in "Nature" of June 9th.

THE annual Conversazione of the Royal Society was held on June 15th. We hardly need to say it was at high-water mark.

THE total number of licensees under the Vivisection Act in 1891 was 152, of whom forty-three, however, made no experiments. There were fifty-nine licensed places in forty different institutions in England and Scotland. It is further stated in the report that licences and certificates are only granted and allowed upon the recommendation of persons of high scientific standing. The total number of experiments performed in 1891 was 2661, of which 875 were performed under licence alone, the remainder being performed under certificates. In 986 experiments the animals operated upon suffered no pain, complete anæsthesia being maintained from the beginning until the end, when the animal was killed. In other cases the animals were anæsthetized during the operation, but were allowed to recover. In these cases the animals were operated upon with as much care as human beings. In the bulk of the cases the operations were very simple. Among the diseases the causation of and protection from which occupied the attention of the licensees during 1891 were tubercle, cholera, cancer, erysipelas, diphtheria, influenza, rabies, glanders, distemper, blood-poisoning, lead-poisoning, goitre, and cretinism.

THE collection of butterflies belonging to Mr. Naish, of Bristol, sold last month, fetched as follows: Seven examples of *Lycæna dispar*, an extinct British butterfly, realised 16*l.* 8*s.*, or an average of 2*l.* 7*s.* each. A "lot" of four *Polyommatus acis* was knocked down for 18*s.* Eight *Lælia cænosa* (apparently recently extinct) brought 3*l.* 17*s.* 6*d.*, and one fine example of *Noctua subrosea*, no longer a native of Britain, and the continental form of which is very different in appearance, fetched 2*l.* 10*s.*

ISOPRENE, a hydro-carbon, discovered among the products of the destructive distillation of india-rubber, was in 1884 found by Dr. W. A. Tilden, F.R.S., among the volatile compounds obtained from the action of moderate heat on oil of turpentine. When isoprene is brought into contact with strong aqueous acids, for example hydrochloric acid, it is converted into a tough elastic solid, pronounced to be true india-rubber. Not long ago Dr. Tilden observed that some isoprene made from turpentine and kept in bottles had become thick and syrupy in appearance, and on examining it found lumps of a solid substance floating in it. These proved to be caoutchouc of a yellowish colour. He accounts for the spontaneous formation of the rubber by supposing that a small quantity of acetic or formic acid had been produced by the oxidising action of the air. The artificial rubber, like natural rubber, appears to consist of two substances, one more soluble in benzine or carbon bisulphide than the other. When dissolved in benzine the evaporation of the solution leaves a residue agreeing in all respects with a similar preparation of Para rubber. The artificial rubber unites with sulphur to form vulcanite. It is obvious that if the artificial rubber can be made at a sufficiently low price, there is a great field before it.

IN these days of scientific culture it is difficult for an artist to avoid marring the effect of his work by some error of science; and Professor Norman Lockyer, Professor Du Bois Reymond, and others have been strongly urging artists to study science—not merely anatomy, but physics. The day appears to be coming when lectures on these sciences will form part of the training of an artist. Ruskin is opposed to science teaching for the artist, although Professor Du Bois Reymond considers this ridiculous. The artist should have a knowledge of science, but he should work in the spirit of art.

MICROSCOPY.

THE QUEKETT MICROSCOPICAL CLUB.—A conversazione, attended by about 600 or 700 persons, given by the officers of this club, was held at Freemason's Hall, Great Queen Street, W.C. Among the many and various objects exhibited we may without invidiousness mention the following. Living and mounted specimens of cattle ticks (larvæ and adults) from Natal (*Amblyomma hebræum*) and not previously exhibited in this country, Mr. R. T. Lewis; scale insects (*Aspidotus conchiformis*) on apples imported from Tasmania, Mr. J. E. Mainland; *Volvox*

stellatus, Mr. J. D. Hardy; a curious spiny spider (*Gasterocantha cancriformis*) from Trinidad, Messrs. Watson and Son, who also exhibited some specimens of fertilized seeds of the sugar cane, only recently discovered, the canes having been always propagated by cuttings; Bacilli of influenza, Mr. Beck; a plumed mite (*Glyciphagus plumiger*), Mr. Oakden; circulation in Valisneria under $\frac{1}{12}$th objective, Mr. Powell. There was, as usual, a large show of pond-life by Messrs. Andrew, Byrne, Dadswell, Hind, Rousselet, White and others. Foraminifera were shown by Mr. Earland, and Diatomaceæ by Mr. Wynne E. Baxter, Mr. Rohr, Mr. Soar, and others. Mr. C. Lees Curties projected a large number of microscopic slides on the screen at intervals, with the lantern microscope. A good selection of music was given by Drs. Guthrie, Leonard, and Dundas Grant, Mrs. Grant, Messrs. Fenigstein, G. and W. Goss, and other friends of the members, during the very pleasant evening which was spent.

ZOOLOGY.

Curiosities of Worm-Life—One of the most peculiar abnormalities which I have ever seen has just come to hand from Perth, in the shape of a worm with two heads. As I showed in my article on page 108, double tails are by no means rare. I have, however, never yet heard of a worm such as I have figured here. It is, as usual, a specimen of the long worm (*A. longa*, Ude), and when in motion the second head had all the appearance of a snail's feeler, or antenna. I received the specimen, with a collection of Scottish worms, from Mr. Ellison, the genial curator of the Perth Natural History Museum. The embryology of this species has never yet been studied, but the constant recurrence of such peculiarities suggests some interesting lines of thought, with which I hope to deal more fully when I have cleared some of my field-studies away. I take this opportunity of thanking my numerous correspondents for their encouragement and help, and shall be glad if others will favour me with consignments addressed 4, The Grove, Idle, Bradford.—*Hilderic Friend.*

Fig. 104.—*Allolobophora longa*, Ude. Nat. size.

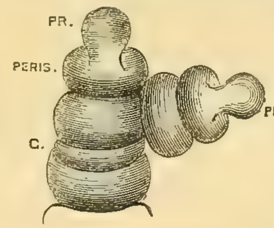

Fig. 105.—Twin head of *A. longa*, enlarged.—*g.* gullet, *pr.* prostomium; *peris.*, peristomium.

The Pine Marten.—A specimen of this rare animal was taken in a rabbit-trap at Coolbawn, Co. Wexford, on the 1st of May, and has been placed in the Zoological Gardens, Dublin, by its captor, Mr. Arthur Ruttledge. The marten is an animal now very little known in Ireland, and this occurrence is of great interest, inasmuch as it was previously an open question whether the species survived or not in Co. Wexford. A year ago I had indeed strong suspicions that such an animal was committing depredations among the lambs and poultry at Ballyhyland, about four miles from Coolbawn; and there can be little doubt that a specimen was trapped at Ballyhyland nine or ten years ago, and released by some of the labourers, who mistook it for a young fox. But Mr. Arthur Ruttledge's specimen is, so far as I know, the first authenticated marten taken in this country for a long time; and from the fact of the capture having been, as Mr. Ruttledge tells me, quite accidental (the trap having been set only for rabbits, and the marten having committed no damage to lead to suspicion of its presence), it seems highly probable that other martens remain in the vicinity. I may add that Wexford is not one of the counties mentioned by Thompson in his enumeration of those in which the marten was known to exist. In saying this, however, it is proper to recall the fact that Thompson's notes on the mammalia were very incomplete at the time of his death, and are only known through the medium of a posthumous publication.—*C. B. Moffat, Ballyhyland, Co. Wexford.*

A Plague of Caterpillars in Epping Forest.—At present the oak-trees on that side of Epping Forest which extends from Chingford Station towards Sewardstone, as well as in the neighbouring lanes and hedge-rows, are being devastated by an army of small caterpillars (mostly Geometræ) which dangle in strings from the twigs of the trees. Meantime the sparrows, which abound in the gardens of the neighbouring farms and cottages, keep aloof from the scene of mischief, finding elsewhere food which they prefer. To-day (May 23rd), whilst traversing nearly two miles of the trees infested, I may safely say that I did not see a single sparrow. The blue-tits are doing their best against the enemy, but their numbers are quite insufficient. This is one of the many cases which the advocates of the sparrow would do well to take into fair consideration.—*J. W. Slater.*

Re "Secreting Glands in the Feet of Flies."—We are sorry the following reached us too late for insertion: "I am requested by Mr. Jenkinson (who has been seriously ill, but is now much better) to inform you that the numbers, viz., 47 and 48 affixed to illustrations in Science-Gossip should be transposed for each to apply to its proper illustration."—*J. F. Bell.*

New Zealand Bumble-Bees and Clover.—Some years ago an interesting fact was laid before the public by the late Charles Darwin, namely, that red clover could only be fertilised and produce seed through the agency of bumble-bees. On the New Zealand plains the red clover grew with a rank luxuriance, such as we know nothing of in this country. But it could produce no seed, because there are no bumble-bees in New Zealand, so the colonists had to send every year to England for red clover seed, which was both annoying and expensive. A great many attempts were made by naturalists to convey bumble-bees to New Zealand from this country, the late Frank Buckland taking great interest in this important work. The chief difficulty lay in crossing the equator. There the bumble-bees literally died off "like flies." They could not stand the intense heat. But when vessels were fitted up with freezing chambers, about ten years ago, it was found possible to transfer British bumble-bees in a hibernating state to the Antipodes. The bumble-bees went into what they thought was their winter sleep in England, and woke up in New Zealand. Now the red clover in the latter country is fertilised by them and produces seed. The bumble-bees have multiplied abundantly, even within the few years since they were introduced. Indeed, there seems to be looming a danger ahead lest they should become as great a pest as rabbits. In a recent article in the "New Zealand Journal of Science," Mr. G. M. Thompson gives an account of the introduced bumble-bees in New Zealand, as well as a list of the plants and flowers visited by these bees. He states that, with a few exceptions, he has never heard of the introduced bumble-bees visiting the flowers of New Zealand native plants; that they have become so extraordinarily abundant that the question has arisen in his mind as to whether they would not become as serious a pest to the apiarist as the rabbits have proved to the farmer and cultivator, on account of their absorbing so much of the nectar of the flowers. He also points out the fact in connection with the life of the bumble-bee in New Zealand, that in many parts of the colony it does not hibernate at all, but is to be seen on flowers all the year round. In parts of Australia the introduced hive-bees are ceasing to store up honey, having already found out there is no need for the habit in countries where flowers blossom all the year round!

Protection of Birds.—The committee of the Norfolk and Norwich Naturalists' Society are very desirous of bringing under the notice of landowners and agriculturists the great desirability of affording more efficient protection to useful birds, particularly those which, as destroyers of vermin and injurious insects, render immense service to the farmer and the community at large. Frequent comments and letters have recently appeared in the public journals as to the disastrous effects resulting from the indiscriminate slaughter of many useful species, not only in this country, but also on the continent, and it is hoped that the publicity given and the attention drawn to the subject will lead to a more judicious course of action. The importance of this matter, in view of the great devastation caused by the plague of field-voles (mice) in some parts of Scotland, and past experiences in Lincolnshire, cannot be overlooked, and the opinions of the Scotch farmers in the districts affected, quoted from the reports to the Board of Agriculture, point to the folly of destroying owls, hawks, and weasels. The barn owl, a true farmers' friend, is much persecuted, but a more useful bird, as a destroyer of vermin, does not exist. It has been computed by competent observers, that when it has young it will bring a mouse to its nest every twelve or fifteen minutes, and as many as twenty good-sized rats, perfectly fresh, have been counted in a single nest. A recent communication to the daily papers states that a nest containing five young ones, being taken and placed under a hen-coop about a mile distant, no less than twenty-four rats, large and small, brought there by the parent birds, were found lying outside the coop the following morning. The owlets were at once returned to the place from whence they were taken. The kestrel hawk, a great killer of mice, is another bird which merits protection, and it is much to be desired that game-preservers would give their keepers stringent orders not to molest it. It is greatly to be wished that some steps could be taken by those who have the control of the rivers and waterways of Norfolk to check the cruel and dangerous practice of shooting swallows and martins, which has of late become so frequent in this country, more especially in the neighbourhood of Norwich. To such an extent is the destruction of our native birds carried on, that it is not improbable further legislation in the matter will be called for, and it is to be hoped the Board of Agriculture will continue to prosecute their enquiries into the pecuniary loss accruing from such destruction. My committee earnestly trust that all lovers of nature will, by their own example and influence with others, not only extend their protection to these our feathered friends, but will also do their best (in accordance with one of the fundamental objects of this society) to aid in "the circulation of information which may dispel prejudices leading to their destruction."—*W. A. Nicholson, Hon. Sec. Norfolk and Norwich Naturalists' Society.*

BOTANY.

Hen-and-Chickens Daisy.—I have to record another curiosity in the shape of a "hen and chickens" daisy, which I found growing on the lawn in our garden here on the 23rd of May. The plant had then ten heads of flower on it, all of which, except three, showed a "chicken" growth. Round the edge of the largest head, just above the involucre, grew thirteen small heads, five of which had distinct stalks, while the rest were sessile, or nearly so. The florets of the central head of this flower were greenish-brown and imperfect; some of the bracts had developed into small leaves, and its stem was thickened but not fascicled. One of the other flowers had

Fig. 106.—Hen-and-Chickens Daisy.

twelve small heads growing round it, four of which had distinct stalks, and another head bore six small heads, all nearly or quite sessile. The central florets of the heads, both primary and secondary, were, for the most part, smaller, greener, and more slender than in ordinary daisy flowers, the stamens imperfect, and the lobes of the corollas deformed and concave at the tips. I could not find any normal "central" florets; and of the "ray" flowers one had three, another two rays, and the corolla of a "central" floret had six lobes and two opposite scales growing from its base, looking like pappus. In the more normal heads there were four or five rows of ray florets, and these rays on nearly all the flowers were pure white.—*Frank Sich, jun.*

Liverpool Naturalists' Club.—The second field meeting of this club was held at Brynypys and Erbistock on May 22nd. The morning was fine, and fifty-eight members and friends left for Wrexham, where on arrival wagonettes were in waiting to convey the party by Bangor, Isycoed and Brynypys to Overton. Here all walked two miles by the banks of the Dee, which brought the company to Erbistock Ferry, on crossing which the wagonettes were again in requisition, the return journey being by way of Marchwiel to the Wynnstay Arms Hotel, Wrexham. Many interesting and uncommon plants were noticed on the route, amongst which may be mentioned *Chrysosplenium alternifolium*, *Paris quadrifolia*, *Carex pendula*, and *Saxifraga granulata*. The prize for the best basket of wild flowers was awarded to Miss E. M. Davies.

GEOLOGY.

The Underground Circulation of Water.—In an address to the Meteorological Society, Mr. Baldwin Latham (perhaps the best authority on the subject—he and Mr. De Rance) observed that at certain particular seasons of the year it was possible to indicate the direction and volume of the flow of underground streams, even when they were at a considerable depth, owing to the formation of peculiar lines of fog. Upon comparison with underground temperatures, which were taken at the same period, it was found that in the temperature of the ground there was for most months in the year an effectual check against the escape of the vapour arising from water in the ground; the temperature of the ground acted as a condenser, for, as a rule, except between September and November, there is always some strata of the ground within 25 ft. of the surface, which is colder than is due to the tension of the vapour given off by the ground-water; but about the month of September or October there are limited periods when no part of the ground between the ground water-line and the surface is colder than the ground-water. Consequently, in these short periods vapours readily escape from the ground, and when accompanied by cold air and a clear sky, as often happens in September and October, then it is that those particular fog-lines appear which indicate the presence of ground-water. It appears that in nature there are constant checks supplied against the inordinate loss of water from the surfaces which receive it, and very dry surfaces are often compensated to a considerable degree by the moisture which is condensed in them owing to the difference of temperature between their surface and that of the atmosphere; whilst with deeper waters, as long as the vapours can serve the uses of vegetation, an effectual check by the temperature of the ground is provided, so that these vapours are condensed within a limit from the surface sufficiently near to be brought up by capillarity to serve the requirements of the growing plan; and possibly it is by reason of this provision in nature that our great

chalk downs that contain the subsoil water at considerable depth below the surface do not suffer so much in a dry season as other lands in which there is no subsoil water.

West Indian Geology.—At the last meeting of the Geological Society, an important paper on "The Tertiary Microzoic Formations of Trinidad, West Indies," was read by Mr. R. J. Lechmere Guppy. After giving an account of the general geology of the island, and noticing previous memoirs devoted to that geology, the author describes in detail the characters of the Naparima beds, to which he assigns an Eocene and Miocene age. He considers that the Nariva Marls are not inferior to but above the Naparima Eocene Marls, and are actually of Miocene date. The Pointapier section is then described, and its Cretaceous beds considered, reasons being given for inferring that there was no break between the Cretaceous and Eocene rocks of the Parian area. The author observes that the Eocene molluscan fauna of Trinidad shows no near alliances with other known faunas, thus differing from the well-known Miocene fauna of Haiti, Jamaica, Cuba, Trinidad, and other localities. Only one mollusk is common to the Eocene and Miocene of the West Indies. The shallow-water foraminifera are found in both Eocene and Miocene, whilst the deep-water foraminifera are nearly all of existing species. It would appear that during the Cretaceous and Eocene periods a sea of variable depth (up to 1000 fathoms) occupied the region now containing the microzoic rocks of Trinidad, whilst a mountain-range (which may be termed the Parian range) extended continuously from the north of Trinidad to the littoral Cordillera of Venezuela, forming the southern boundary of the Caribbean continent, and possessing no large streams to transport mechanical sediment into the Cretaceo-Eocene sea which opened eastward into the Atlantic. In the discussion which followed, the president said the Society had lately heard the paper by Messrs. Jukes-Browne and Harrison on the deep-sea deposits of Barbados, and the present paper would be useful for comparison with the results of those authors. Mr. J. W. Gregory stated that the conclusions as to the truly deep-sea origin of some of the Trinidad rocks stated in an appendix to the paper agreed with those just announced by Dr. Hinde. He remarked on the great interest of the geology of Trinidad, as that island occurs at the intersection of the two main Caribbean lines of movement, viz., that along the Cordillera of Venezuela, and the later one along the Antillean chain. It was from Trinidad that evidence as to the exact correlation of the Cainozoic deposits of this area might be expected, for a series of shallow-water beds containing mollusca there occurred below deep-sea beds almost identical in character with those of the Oceanic series of Barbados.

NOTES AND QUERIES.

North Kent Natural History Society.—The biennial meeting of this society was held on Wednesday, May 11th, 1892, Mr. Woodward, the President, in the chair. It was unanimously resolved, that the annual subscription to the Society for members residing within the radius of ten miles, should be reduced to 5*s*. payable quarterly, and for country members (those living beyond the radius) should be 2*s*. 6*d*. payable in advance. Exhibits were shown during the evening by several members. A small library is connected with the Society, and monthly journals are taken. It is earnestly hoped that Naturalists residing in this neighbourhood and the metropolis will join the Society, which meets on alternate Wednesdays. Donations and gifts of Books to the library will be thankfully received, as will also the names and addresses with the Entrance Fee, 1*s*., of any person wishing to become a member, by Mr. C. H. J. Baldock, 1 Chapel Street, Woolwich, S.E., or by the Secretary, Mr. H. J. Webb, 3, Gunning Street, Plumstead.

Professor Frank Clowes has adapted the ordinary miner's safety-lamp as a fire-damp tester. Ordinarily when there is fire-damp in the air a luminous "cap" appears over the flame, and the height of the cap increases as the percentage of inflammable gas in the air increases. But when the percentage is small the cap is not very apparent, unless the flame is feeble. To remedy this defect, Professor Clowes places a small tube between the wick and the case, and introduces hydrogen by it from a steel reservoir. When the air has to be tested the hydrogen is allowed to enter and ignite at the ordinary flame of the lamp, which is then turned down. It burns with a pale light, and the luminous cap over it due to fire-damp is readily measured. When the test is made the ordinary flame is re-lit and the hydrogen one extinguished.

The importance of keeping the surface and extremities of the body warm during brain-work has long been recognised in a general way; but Professor Mosso, of Turin, has demonstrated that when the brain is active much more blood is sent to it from the peripheral parts of the body. He has also found that the circulation of the blood in the brain is subject to fluctuations which are apparently not dependent on physical activity. Fatigue, caused by brain-work, acts as a poison which affects all the organs, especially the muscular system. The blood of dogs fatigued by long racing also acts as a poison, and when injected into other dogs makes them exhibit all the symptoms of fatigue. Sense of fatigue seems to be due to the products of the nerve-cells rather than to deficiency of proper substance.

"To the Curious Observers of Natural Phenomena.—T. Hall, well known to the virtuosi as the first artist in Europe for stuffing and preserving all kinds of Birds, Beasts, and Reptiles, so as to resemble the attitudes and perfection of life; respectfully informs the public, that by a method peculiar to himself, he now makes the stuffed birds to sing as though they were alive. Specimens of his surprising Art may be seen at his Museum, opposite The terrace, City Road, Finsbury Square, London; where a capital collectlon of Stuffed Birds, Beasts, and Insects, are to be sold, in the highest state of preservation, well adapted for Tea Gardens and other public places, by which a great profit may arise to

the purchaser's advantage, he also buys and sells all sorts of curiosities. Admission to the Museum 6*d*. each." Written by a lady on seeing Hall's Grand Zoonecrophylagium. (Here follows some verses too long to quote.) S. Bailey, printer; 50, Bishopsgate Within (added in ink, March 1800). Can any reader tell us something about Mr. T. Hall and his singing-birds, in this what must have been a wonderful Zoonecrophylagium?—*W. E. Harper.*

INTELLIGENCE OF A CAT.—Sixteen or seventeen years ago, I had a very intelligent tom-cat. When out at night, he used to knock by lifting up the splash-board of the hall-door, and letting it fall; after knocking a couple of times, he would wait a reasonable time to allow the door to be answered, and if it was not he would knock again. He taught this trick to our other cat also. I have seen him try to open a locked cupboard by springing at the key, and throwing his weight so as to turn it; he did turn it to some extent, but not enough to open the lock. He rarely stole anything in our house, but was a daring robber from the neighbours, and he generally brought his booty to me. On one occasion he brought me a half-cooked chop, quite hot, which looked as though it had been taken from the frying-pan; but as he was not burned at all, I can hardly believe that possible. At that time I was reading hard, and used to take a glass of milk with some bread for my supper; if I had occasion to leave the room I used to put my bread and milk in his charge; not only would he not touch it himself, but he would not allow the other cat to do so; and on my return, if I indicated with my thumb on the outside of the glass, how much he might drink, he would drink down to my mark, and then leave off. I could mention many more things about him, similar to these, but there is nothing specially remarkable about them; they evince intelligence, but that intelligence is directed to objects ordinarily coming within the scope of a cat's mind; but one circumstance seems to me remarkable, and difficult to account for. I was once playing chess with a friend; we were using small bone men, red and white, and I had white. The cat was sitting on the table beside the chess-board, and was watching the game very intently; once when it was my turn to move, I pondered for some time; the cat suddenly advanced one of my pawns a square with his paw, removed one of my adversary's men from the board with his teeth, dropped it along with the captured men, and finally, seized the end of my nose with his teeth very gently, as though to call my attention to what he had done. As might be expected, the move made by the cat, although possible, was a very bad one; but it seems to me strange that a cat should show any interest at all in the subject, and his action seems to show that he had observed with sufficient attention to notice the alternation of moves, the fact that my men were white and my adversary's red, that a move of a man of one colour was frequently followed by the removal of a man of another colour, and that the division of the board into squares regulated the moves (because he advanced the pawn exactly one square). The idea which occurred to me at the time was that the cat was puzzled by the various shapes and different moves of the men, and believed he had found a uniformity in the moves of the pawns, accordingly when he got an opportunity he moved one in the way which he believed to be correct, and then drew my attention to see if it was so. But on later consideration I saw that the facts did not amount to proof of this. The move was the ordinary one, not the capturing move of the pawn, and the piece removed had no connection other than being near it, with the pawn moved.—*J. R. Holt.*

STRANGE CONDUCT OF CATS AND HENS.—In a loft, a few days ago, I had two hens sitting upon their eggs; also a cat nursing her kitten a few days old in an open box (she had had four, the others being taken from her). One of the hens had started to bring out her birds with the usual chirping and cheeping—this was too much for her neighbour whose eggs had given no signs. She left her nest and attacked puss in all her fury and frightened her down the ladder, returned to the kitten, adopted it as her own, chucking and nestling it with all the fondness of a mother. By-and-by the cat was seen making for the loft accompanied by her old mother (a much larger and fiercer cat than herself). Then a great uproar was heard, and, on my appearance, the two cats had got possession of the box and kitten, and were defending themselves from the attacks of the enraged hen. Getting a hold of her, she was put upon her own eggs and a chick taken from her neighbour's brood put under her, she quietened down. After this both hens with their eggs and chicks were removed to an outhouse, to be their abode for a time. Yesterday the girl whose duty it was to look after them, discovered one of the chicks wanting, which was afterwards discovered in the box in the loft; the cat fondling aud nursing it beside her kitten. To take it there she must have leaped five feet to an aperture in the outhouse, descending as far, carrying it some distance and taking it up the ladder; all of which she accomplished without injuring the chick in the slightest.—*P. W., Ayrshire.*

THE MURDER OF A SPIDER BY ANTS.—On Whit Monday I witnessed a strange and curious sight: The murder of a spider by ants. I was scanning a small bed in the garden when presently here trots across it an uncommonly large and sluggish spider pursued by a few ants. He had probably trespassed on their domain and done some damage to their passages in passing over. However, they soon overcame him, and began to attack him ferociously. Some would cling tenaciouly to his limbs, and a number would overrun and bite him in his bulky abdomen, while a few, more daring than the rest, attacked him in the head. Now and again they tried to arrest his progress by clinging fast to the end of his limbs by their jaws and planting their own, with all energy, in the ground. By and by the emmetic army grew stronger by fresh arrivals, and they completely overhauled their victim more than once; while in this position he would, by dint of muscular strength, heave his legs in the air like the jib of a crane, carrying with them a load of ants. To berid himself of them in this manner proved an utter failure, they seemed to enjoy such aerial rides. Still adhering by their jaws they would at whiles ply their limbs with such rapidity as to become quite invisible. This, perhaps, was a measure of their anger. At last the poor spider got entangled in a piece of waste, and here he was held down much like Gulliver by the Lilliputians, and, more unfortunately, slain.—*G. Rees, Aberystwyth.*

WE have received from Mr. F. L. Dawes No. 19 of "Bibliotheca Zoologica" (Berlin); also Messrs. Wesley and Son's No. 112 Catalogue of his "Natural History and Scientific Book Circular," advertising important works on Geology.

CLIMBING HERMIT-CRABS.—I have never heard of hermit-crabs climbing bushes, but a few days ago I was walking along one of the valleys here when my

attention was drawn to a white object hanging on to one of the bushes which—contrary to general opinion—can be found on these barren rocks. I thought it was a cocoon of some kind, but found it was a hermit-crab, and on looking around I found several more on the bush. They had climbed from 1 ft. to 3 ft. from the ground, and seemed to be feeding on the leaves or berries; and so many more were crawling about below, that their shells, knocking against the stones, made a pattering noise like hail. The sea was quite two hundred yards off, and the sand and stones must have made the journey inland a laborious one for the crabs. It was so curious to see these uncouth creatures "up a tree," that I wondered if this was a well-known habit of theirs.—*S. F. Clark, M.B., Surgeon-Captain, Medical Staff* (*Aden, Arabia*).

THE VOLE PLAGUE.—This creature, which is at present devastating whole districts in Scotland, generally described as a "field-mouse," is nearly connected with the water-rat, and allied to the beaver. The fact that they are water-loving animals may perhaps suggest some method of destroying them. They always suffer severely during the long-continued droughts, and they delight in ditches. The wet seasons are thought to have had something to do with their enormous increase. It appears inconceivable that their superabundance can be entirely due to the destruction of their natural enemies. It may be stated that the vole, or short-tailed field-mouse, is found in the colder extremes of three northern continents, while the true field-mouse affects the warmer regions. In Greenland there are voles and no true mice; in the Tropics there are true mice and no voles; and there are none in South America, South Africa, or Australia. There is no other mammal in Europe, Asia or America so numerous as the vole, and so prone to petty depredations. Its evil doings have been reported to several Governments besides our own, and in Germany, where this rodent had suddenly increased enormously in numbers, it was officially condemned and executed—in one year—to the number of 1,000,000 or 2,000,000.

PHOTOGRAPHING FLYING BULLETS.—The "Amateur Photographer" contains some details of the experiments which Mr. G. V. Boys has been making in photographing flying bullets by the aid of an electric spark. These experiments, it will be remembered, were briefly touched upon by Captain Abney in his presidential address at the Camera Club Conference. The spark, it is said, is generated by the discharge of a Leyden jar, there being in the conductor from it two breaks, which together the electric fluid has not pressure sufficient to jump. But when the bullet or flying object makes contact with one, the spark is instantly emitted from the other. As then the duration of this spark may be even less than the one-millionth of a second, it is far and away in excess of the speed of the bullet, which consequently appears to be stationary, and a very precise view is accomplished by the camera. This view records the form of the bullet, its direction and inclination, the balling up of the air in front of it, the long-drawn-out vacuum, and the various other vortices and contortions of the surrounding atmosphere through which it is passing. Photographs of actual experiments were then enlarged into gigantic pictures on the screen, and made perfectly clear in all their singular details to the audience. Some of the most remarkable were those which showed the passage of a bullet through a sheet of plate glass. In one the head of the bullet was seen protruding, carrying what seemed to be a dark cloud of lead vapour, caused by fusion in the impact, and another showed the storm of dust from the smashed up glass; while others gave views of the strains set up in the glass plate around the clean perforation the bullet had made. Clean perforations of this nature have long been known, but the reason is rendered additionally clear in that the speed of the bullet exceeds the speed at which cracks in the glass can progress. The result, consequently, is that the round portion of glass in front of the bullet is locally pounded into powder before the exterior portions have time to start into motion. Some notice was also taken of the effects of the dust and vapour envelopes of the bullet in the transmission of sound, and also how, by a series of differently-inclined diagonal perforations through the bullet, and the capacity of light being seen through them, the effects of rotation might be observed, and details of the differences of spin effected between that given by the barrel and those produced in the rapid passage of the missile through the air.

STOCKPORT NATURALISTS AT THE ISLE OF MAN.—A number of the members of the Stockport Society of Naturalists during Whit week spent an enjoyable time at the Isle of Man. On arriving at Douglas, where they were met by the President, Mr. P. Kendal, they took train to Port Erin, where they took part in the opening of a Biological Institute, a ceremony which was performed by the Lieutenant-Governor of the Island. They took up residence at Port Erin, and Sunday, Monday, and Tuesday were spent in proceeding with their study of geology, etc., in the island. Much interest was centred in the dredging-vessels which were stationed at Port Erin.

KINGFISHERS AND THE MAYFLY.—A correspondent in the "Field" asks, Do kingfishers hawk flies or butterflies? I picked up the other day, outside my dining-room window—which is a bay, and can be seen through from side to side—a kingfisher quite dead, with a white butterfly also dead close to it. The bird had no wound of any kind, nor was its plumage hurt. It seems to me it must have flown against the plate-glass, and killed itself by concussion. The butterfly had one wing damaged. I am the more sorry, for, beyond losing the beautiful bird, it was one of a pair which had a nest in the bank of a stream near my house, which my son has since discovered had been rifled. We had noticed these birds frequently passing by the house in going to and fro from watercourses in my meadows to the main stream. I cannot help also mentioning the most wonderful mayfly appearance I have ever known. It began last Friday afternoon, and continued up to yesterday. I approach my premises by a bridge across the stream called the Bourne or Burn, an affluent of the Wey, and on Sunday and Monday, in its immediate vicinity, the air was positively clouded with these flies. Every small spray of leaves had flies on it; they lay about on the ground, and over the stream itself there were swarms. Without exaggeration, I may describe them as being in thousands. I never saw such a sight, and I have been a fisherman off and on for fifty years. Alas! our stream has no trout to partake of this aldermanic banquet. Yesterday I saw several of the flies at least a mile away from the stream, but there was a high wind.

STRANGE SITE FOR A ROBIN'S NEST.—The enclosed cutting is from the "Bradford Observer," May 16th. I can vouch for its authenticity, as the Bowling Club is only a few hundred yards from my residence:—A few weeks ago a pair of robins built themselves a nest in the letter-box of the Manningham Bowling Club. The box is in a door leading into the

bowling-green from Cunliffe Road, and having a circular orifice inside, the birds were able to get in and out without trouble. The postman, finding what was going on, left his letters in another place, and the birds were left undisturbed except by the opening and closing of the door, which after a time ceased to concern them much. Four eggs were laid, on which the mother had sat for a fortnight, when some ruthless person stole them, much to the regret of the members of the club, who had felt quite proud of their feathered guests. The nest has now also disappeared, so that the eviction is complete.—*Harry B. Booth.*

SPONTANEOUS COMBUSTION.—Professor Vivian Lewes, of the Royal Naval College, who has given special attention to the matter, recently drew renewed attention to the subject of spontaneous combustion in coal cargoes in a paper read before the Society of Arts. The conclusion which Professor Lewes has come to, and the recommendations which he has made to obviate the loss of life and property arising from this cause, are engaging attention, and may probably be the subject of legislation. The Royal Commission appointed in 1875 to inquire into this subject came to the conclusion that the presence of iron pyrites among coal was the primary, and the absorption of oxygen by the coal a subsidiary cause of spontaneous combustion. Professor Lewes exactly reverses the position of these causes, and fixes on the absorption of oxygen by coal as the principal and almost only cause of combustion. To bring about a condition of possible combustion it is necessary that sufficient oxygen should be absorbed. Coal will absorb about twice its volume of oxygen. A ton of coals will stow in a space of about 42 cubic feet, of which space the coal itself occupies only about 30 cubic feet. Hence about 300 cubic feet of air are required to completely saturate a ton of coal with oxygen; and Professor Lewes maintains that with the ventilation that can be applied in a large cargo hold, the amount of air will only, roughly speaking, be about sufficient to place the coal in its most dangerous condition, and have no effect in cooling the mass or carrying off the dangerous gases. The contributory causes of combustion Professor Lewes finds to be the increase in the weight of coals carried in one hold, usually accompanied by fine subdivision due to the method of loading; the pressure of moisture, which increases the action of the absorbed oxygen; ventilation, and the presence of external causes of heating, such as the proximity of a boiler or steam pipe to a bulk-head against which the coal is stowed.

WILD DUCK'S NEST.—A wild duck, which recently built its nest in a tree near the mansion, in Wildermere Park, Sevenoaks, forty feet above the ground, has hatched her young and returned to the lake. The young ducks, eight in number, followed, running along the branches and alighting on the ground from the nest without the slightest injury. This was witnessed by Mr. Burroughs and two or three members of the household, and a few days ago our representative saw the mother sitting on the eggs in the tree.—*The Kent and Sussex Courier, May 27th*, 1892.

ELECTRICITY guards many of the treasures of the Metropolitan Museum of Art in New York. In the room containing the Moses Lazarus collection of miniatures, painted porcelain, and other rich and valuable objects of art, there are wires running underneath the lid of each case. If anybody tried to lift the cover or disturb it in any way, a bell would ring in General Di Cesnola's office, and also give warning on the ground floor by ringing a big gong. There is a similar arrangement in use with other valuable cases.

A WIND apparatus for generating electricity and charging secondary batteries has been patented in Canada by Mr. James M. Mitchell, of Atlanta, Ga. The device consists of a dynamo mounted on high tubular standard or staging and driven by a wind wheel, the current generated by this dynamo is stored in a secondary battery ready for use, the generating circuit is automatically opened when the secondary battery is charged to its full capacity. The current generated at different times and in different quantities, owing to the variable force of the wind, is safely stored and may be used for every purpose.

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

TO ANONYMOUS QUERISTS.—We must adhere to our rule of not noticing queries which do not bear the writers' names.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply DISGUISED ADVERTISEMENTS, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges," which cannot be tolerated.

WE request that all exchanges may be signed with name (or initials) and full address at the end.

SPECIAL NOTE.—There is a tendency on the part of some exchangers to send more than one per month. We only allow this in the case of writers of papers.

TO OUR RECENT EXCHANGERS.—We are willing to be helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

W. W. C. (Wolverhampton).—The specimen sent us is the Chimes (*Allium schœnoprasum*).

T. H.—It is the Silverweed (*Potentilla argentea*), not a common plant.

R. S. T.—The Saw-fly (*Sirex giganteus*). See a good figure of it in "Playtime Naturalist."

W. J. S.—The New Zealand caterpillar with the clubbed fungoid growth at the tail was figured and described under the common name of the "Vegetable Caterpillar," in SCIENCE-GOSSIP for 1865. It has long been a popular wonder, and thousands of them have been sent over to England by colonists to their natural history-loving friends.

F. J. R. (Clifton).—Many thanks for the specimens of abnormal flowers of foxglove. No other order has its members so likely to "go wrong" than the Scrophulariaceæ, and no other order has such a wide range of external floral structure. The foxglove is especially guilty in this respect. The peculiar form of aberration in the specimen sent is described by Dr. Masters in his notable and rare book, "Vegetable Teratology," under the name of synanthy—that is, several flowers growing together, the number of which can be ascertained by counting the stamens. The synanthic flower measured 4½ inches across—an unusual size.

J. E. W.—The limitation you suggest as to the price of the book you require rather ties one's hands. The best and *cheapest* book on minute organisms is Dr. M. C. Cooke's "Pond Life" (2*s.* 6*d.*, published by the S.P.C.K.). Another capital and more advanced, is Professor Jeffry Parker's "Bell's Manual of Biology" (Macmillan & Co., 10*s.* 6*d.*). Claus' work (translated and edited by Professor Sedgewick) runs to more money still.

ILLUSTRATIONS.—We should feel obliged if contributors of illustrated papers would kindly send their sketches separately, instead of sketching or inserting them in the text of their MSS. There would then be no danger of misplacement.

MISS S.—The plant is Salsify (*Tragopogon porrifolium*).

E. DIXON.—The shining black flakes in granite are *hornblende*—although there is occasionally black mica present. *Hornblende* or *schorl* is not actually black, but of a very blackish green colour.

THE EARTH-WORMS OF NORFOLK AND SUFFOLK.—The Rev. H. Friend, F.L.S., Idle, near Bradford, Yorks., advises us that the earth-worms of Norfolk and Suffolk are absolutely unknown. Here are chances for young naturalists, who should communicate with Mr. Friend. Mr. Friend is anxious to get the important subject of the distribution of earth-worms determined.

P. S.—You cannot do better than procure a copy of Stark's "British Mosses" (coloured plates and capital verbal descriptions). Doubtless Messrs. Dulau, of 37 Soho square, or Messrs. Wesley, Essex Street, Strand, could supply you with a copy.

T. E. T.—The rock specimen is in the mechanically metamorphic condition known as foliation. The rock constituents are almost in the semi-mica-schist stage. You will see the entire rock district about Ben Lomond is in this foliated, contorted, and semi-metamorphosed state.

EXCHANGES.

WANTED, back numbers of the "Midland Naturalist," first six volumes. Send list of the numbers, with the desired exchange, to—W. B. Grove, 136 Edmund Street, Birmingham.

SLIDES of algæ-washings from Mauritius, containing, among many other forms, some of that beautiful diatom, *Actinocyclus confluens*, Greenow. Send list of diatoms, or other objects.—Rev. A. C. Smith, Woodside, Crowboro', Sussex.

OFFERED, Newman's "British Moths," Kirke's "Physiology," Ganot's "Physics." Wanted, "Carpenter on Microscope," works by Gosse, or offers.—G. A. Barker, 24 Avenue Villas, Cricklewood, N.W.

WANTED, collections of foreign stamps, and rare species of British land and freshwater shells. Offered, lepidoptera and exotic shells.—Miss M. E. Pepperell, 5 Park Street, Bristol.

WANTED, birds' eggs of rare species: can offer shells and lepidoptera.—W. K. Mann, Wellington Terrace, Clifton, Bristol.

WANTED, any volume of Sowerby's "English Botany," 3rd ed., except 7, 8, and 9. Books or herbarium specimens offered in return.—E. F. Linton, Crymlyn, Bournemouth.

OFFERED, SCIENCE-GOSSIP for 1886 (except January), 1887 (except December), and parts 239–242; also fossils from the Gault and carboniferous. Wanted, lignite, peat, anthracite, native alum, native nitre, and Cornish rocks and minerals.

EGGS of sooty and noddy terns, Bartram's sandpiper, etc., for exchange. Send offers to—W. Wells Bladen, Stone, Staffordshire.

MOUNTED leaf of enchanter's nightshade (*Circæa alpina*), showing crystals in sitû, in exchange for other slides of interest. Parts of insects or parasites preferred.—George T. Reed, 87 Lordship Road, Stoke Newington, London, N.

SCIENCE-GOSSIP from 1885 to 1891, both inclusive; also "The Naturalist's World" for 1884 to 1887, complete, but not bound. Wanted, micro. slides or offers.—W. E. Harper, Norfolk Road, Maidenhead.

WANTED, living paludina and cyclostoma; also spirit specimens of tænia, distomum, scolopendra, and scorpio, in exchange for anything in my various catalogues.—J. Sinel, Biological Laboratory, Jersey.

OFFERED, *A. fluviatilis, B. acutus, C. minimum, C. rugosa P. fontinale, P. pusillum, S. corneum* var. *pisidiodes, S. elegans, V. piscinalis*, and *V. pygmæa*. Wanted, *Achatina acicula, C. Rolphii, C. biplicata, S. oblonga, S. Pfeifferi, S. virescens*, or any foreign helices.—T. W. Paterson, 59 Hazelbank Terrace, Edinburgh.

THREE *Tapes decussatus* will be given for any one of the following shells:—*Arca tetragona, A. obliqua, Cardium papillosum, Tellina balaustina, Lutraria oblonga, Nucula cuspidata, Mya Binghami, Panopea plicata, Acera bullata, Pecten striatus, P. niveus, P. Danicus, Terebratula* (any), *Scalaria Trevelyana, Ianthina communis, I. exigua, I. pallida, Trochus granulatus, Clio pyramidata, Aplysia punctata.*—T. E. Sclater, Natural History Stores, 43 Northumberland Place, Teignmouth.

OFFERED, fifty foreign stamps—U.S.A., British Honduras, Columbian and Argentine Republics, etc., all different. What offers in exchange?—Richard B. Corbishley, Breck Road, Poulton-le-Fylde, Lancashire.

L. CAT., 8th ed. Wanted, 5*c*, 29*b*, 61, 68, 71, 72, 81, 133, 166*b* and *c*, 232, 389, 390, 484, 584, 750, 810, 838–850, 891*b*, 932, 1144, 1312, 1338, 1460, 1488, 1508, 1509, 1515, 1706, 1818. Offered, 19, 21, 41, 84, 101, 107*b*, 108, 109*b*, 123, 141, 161, 161*b*, 170, 175, 193, 200, 212, 229, 240, 291, 335, 335*b*, 336, 339, 341, 353, 372, 393, 483, 536, 538, 562, 576, 611, 692, 698, *Hierac. angustum* and *auratum*, 928*b*, 969, 970, 973, 1187, 1194, 1255, 1410, 1483, 1518*b*, 1629, 1630, 1753, 1772, 1813, 1845.—J. A. Wheldon, 9 Chelsea Road, Walton, Liverpool.

WANTED, entomological cabinet, store-boxes, and setting boards, in exchange for secondary and tertiary fossils, birds' eggs, etc.—W. D. Carr, Lincoln.

I HAVE a number of Gault fossils for exchange, principally ammonites and belemnites, and shall be glad to hear from collectors who require same.—Edward A. Martin, 21 Carew Road, Thornton Heath, Surrey.

"American Geology," with plates, by E. Emmons, 4 vols.; "Memoirs of the Geological Survey of the United Kingdom," with plates, 9 vols., 1849–1861; "Palæontographical Society," with plates, 6 vols., 1848–1874; "Catalogue of Shells," by F. Paetal, 1883, offered in exchange for rare shells or offers.—Miss Linter, Arragon Close, Twickenham.

DUPLICATES.—About forty species British butterflies, twenty species British marine shells, and thirty species land and fresh-water shells. Desiderata, British dragonflies, fresh and unset preferred; also grasshoppers, locusts, and crickets, especially mole and field-crickets.—W. Harcourt Bath, Ladywood, Birmingham.

Sphærium corneum, Pis. pusillum, Unio pictorum, Neritina fluviatilis, Byth. acutaculata, Hydrobia ulva, Physa fontinalis, Lim. palustris, Lim. glabra, Helix hortensis, vars. *lutea, lilacina, arenicola, Clausilia rugosa, Clausilia Ralphii, Clausilia laminata, Carychium minimum*, etc., offered in exchange for good specimens of land and freshwater shells not in collection.—C. Baldock, 21 Chapel Street, Woolwich, S.E.

WILL any cryptogamic botanist join me in a ten days' exploration of the Cairngorms (from Speyside) about the middle of July, for mosses, hepaticæ, and lichens?—William Smith, Addison Place, Arbroath, N.B.

DUPLICATES.—Pupa of *Liparis dispar*. Desiderata, numerous ova, larva, and pupa.—Ernest Platt, West Street, Chipping Norton.

FOREIGN shells, chiefly marine, for exchange. Please send lists to—J. E. Cooper, 93 Southwood Lane, Highgate, N.

BOOKS, ETC., RECEIVED FOR NOTICE.

"Farmyard Manure," by C. M. Aikman (Edinburgh and London: William Blackwood & Sons).—"Theoretical Mechanics," by J. Spencer (London: Percival & Co.).—"The Flora of Guernsey," by E. D. Marquand.—"On Geological Zones," by Horace B. Woodward, F.G.S.—"The American Monthly Microscopical Journal" (Washington: Chas. W. Smiley).—"The Entomologist's Record" (London: Elliot Stock).—"The Microscope" (Washington: Microscopical Publishing Company).—"In Starry Realms," by Sir Robert S. Ball, D.Sc., LL.D., F.R.S. (London: Isbister & Co.).—"Mineralogy," by F. H. Hatch, Ph.D., F.G.S. (London: Whittaker & Co.)—"Mediterranean Naturalist," by May (London: W. P. Collins).—"The Physiology of the Invertebrata," by A. B. Griffiths, Ph.D., F.R.S., F.C.S. (London: Reeve & Co).—"Res Judicatæ," Papers and Essays, by Augustine Birrel (London: Elliot Stock).—"Transactions of the Burton-on-Trent Natural History and Archæological Society" (London: Bemrose & Sons, Limited).—"Tanganyika," by Edward Coode Hore (London: Edward Stanford).—"The Organisation of Science," by a Free Lance (Covent Garden: Williams & Norgate).—"The Optical Indicatrix," by L. Fletcher, M.D. (London: Henry Froude).—"Nature Notes" (London: H. Southeran & Co.).—"The Entomologist" London: West, Newman, & Co.).—"Geological Magazine" (London: Kegan Paul, Trench, Trübner, & Co.).—"Magazine of Natural History" (London: Taylor & Francis).—"Essex Naturalist" (Chelmsford: Durrant & Co.).—"Le Diatomiste," par J. Tempere (Paris: 168, Rue St. Antoine; London: W. P. Collins, 157, Great Portland Street).—"Sponge Remains in the Lower Tertiary Strata," by G. Jennings Hinde, Ph.D., and W. Murton Holmes (London: Taylor & Francis).—"On the Age, Formation, and Drift Stages on the Darent Valley," by Joseph Prestwich, D.C.L., F.R.S., etc.—"Healthy Households," by Guy Cadogan Rothery (London: J. S. Virtue & Co.).—"Annual Report of the Wellington College Natural Science Society" (Wellington College: George Bishop).—"The Idler," (London: Chatto & Windus).—"Gentleman's Magazine."—"The Mediterranean Naturalist."—"The Midland Naturalist."—"The Naturalist."—"Natural Science."—"American Microscopist."—"American Naturalist."—"Nature Notes."—"Essex Naturalist."—"Journal and Proceedings of the Essex Field Club," etc., etc.

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A LANCASHIRE NATURALIST—THOMAS GARNETT.

BY WILLIAM E. A. AXON.

A MEMORIAL volume of the late Mr. Thomas Garnett, of Low Moor, Clitheroe, was printed for private circulation, and some notice of it will be of interest to many outside the narrow circle for whom it was originally prepared. Mr. Thomas Garnett was one of three brothers. Mr. Richard Garnett distinguished himself as a philologist, and became an assistant keeper in the British Museum; Mr. Jeremiah Garnett was for many years the editor of the "Manchester Guardian," and Mr. Thomas Garnett settled at Clitheroe, where he passed an active life as a manufacturer, but instead of allowing business to absorb all his attention he found pleasant and healthful recreation in agricultural and scientific observation. The results are now gathered in this volume—"Essays in Natural History and Agriculture, by the late Thomas Garnett of Low Moor, Clitheroe. London: printed at the Chiswick Press, 1883." Only 250 copies were printed. The editing has been the work of the author's nephew, that accomplished scholar and friend of all students, Dr. Richard Garnett of the British Museum. The first paper contains a number of facts and observations relating to the salmon, chiefly based on Mr. Garnett's experience in Lancashire. Written as long ago as 1834, it contains a plea in favour of a wise and not vexatious measure for the protection of the salmon fisheries. He believed that the salmon enters and ascends rivers for other purposes than propagation. In support of this view he cites what in Lancashire is called "streaming." Thus in winter the fish not engaged in spawning, trout, grayling, chub, dace, etc., leave the streams and go into deep water. Another reason is their impatience of heat, which leads the grayling, if the weather is unusually hot at the end of May or beginning of June, to ascend the mill-streams in the Wharfe, by hundreds, and to go up the mill-races as far as they can get. The "salmon" par he holds to be neither a hybrid, nor a distinct species, but a state of the common salmon. In 1851 he wrote some papers describing his own experiments in the artificial breeding of salmon. His interest in the fish is shown by the following quotation:—

"I have had fish sent from two different gentlemen living on the banks of the reservoirs belonging to the Liverpool waterworks; these were beautiful fish, three in number, more like the sea trout than the salmon, and the largest of them weighing two pounds. I had put them into the brooks running into the reservoirs three years before. I also learn that a beautiful specimen of the *Ombre chevalier* (French char) was taken out of Rivington reservoir. About a thousand had been put in by me two years before."

It should be mentioned that Mr. Garnett's experiments on the artificial impregnation of fish ova were made without any knowledge of previous attempts of the same kind. In answer to a suggestion made by Mr. Garnett, the late Sir G. C. Lewis observed: "You might as well propose to shoot partridges only three days a week as to restrict the netting of salmon to only three days." In 1859 Mr. Garnett wrote some papers on the possibility of introducing salmon into Australia, and addressed a communication to the authorities of Tasmania and New Zealand on the subject. He had some doubts as to success, but thought that the experiment should be made, and that New Zealand was the likeliest place for the experiment. In 1843, 1844, 1845, and 1848, he

made experiments in the cultivation of wheat on the same land in successive years, and the results were communicated to the "Manchester Guardian." He also advocated the growing of a short-strawed wheat as peculiarly suitable to the conditions of farming in Lancashire and Yorkshire. The gravelling of his clay soils elicited some amusing comments from his neighbours, one of whom remarked that he had seen land tilled (manured) in various ways, but had never before seen a field tilled with cobble-stones! The cultivation of cotton in India, and in Peru, was another project in which he took a warm interest.

Mr. Garnett was a keen observer of natural history. Some excellent authorities had asserted that the common wren never lined its nest with feathers, but he showed conclusively that this was a mistake. The nest in which eggs are laid, is profusely lined with feathers, but during the period of incubation the male frequently constructs several nests in the vicinity of the first, none of which are lined. The existence of these "cock-nests," as they are called by schoolboys, was doubted, but Mr. Garnett fully made out his case. The grey wagtail (*Motacilla sulphurea*), sometimes looks at its own image in a window, and attacks it with great vivacity. A superstitious neighbour was alarmed by this conduct in a "barley-bird (*Motacilla flava*), and thought it a portent of evil. Her alarm was cured by the young naturalist, who secured the bird of evil omen. Having caught a colony of the long-tailed titmouse, Mr. Garnett and his brother attempted to rear the half-fledged young ones, but of the six old birds, five died in confinement. The survivor was allowed to escape in the hope that it would come back to rear the young ones. This it did, and by the most unwearied exertions supplied the whole brood, sometimes feeding them ten times in a minute. Mr. Garnett took some pains to establish the identity of the green with the wood-sandpiper. The courage of the stoat, and the pertinacious manner in which the marsh-titmouse for a time resisted attempts to drive her from her nest are amongst his curious observations. The creeper, he noticed, associated with the titmouse in winter. The language of birds has not yet been mastered, either by philologists or ornithologists, but it appears that the alarm note of one is readily understood by those of other species. Mr. Garnett desired to make some young throstles leave a nest which was in danger of visitation from mischievous lads. He took one from the nest and made it cry out. Its brethren quickly disappeared, the old bird set up a shriek of alarm, and blackbird, chaffinch, robin, oxeye, blue titmouse, wren and marsh-titmouse, and even the golden-crested wren, which usually appears to care for nothing; in fact all the birds in the wood, except the creeper, came to see what was the matter. Mr. Garnett did not share the prejudice felt by some farmers against the rook, which he held to be serviceable to man. He reckoned that one rookery in Wharfedale destroyed 209 tons of worms, insects and their larvæ. The rook also, he notes, relieved the farmers from the apprehension caused by a flight of locusts in Craven. Contrary to Waterton's opinion, Mr. Garnett describes the process by which birds dress their feathers with oil from a gland. The sedge-warbler owes its local name of "mocking-bird" to its imitative powers in copying the notes of the swallow, the martin, the house-sparrow, spring-wagtail, whin-chat, starling, chaffinch, white-throat, greenfinch, little redpole, whin-linnet and other birds. Of the water ouzel he says: "A pair had built for forty years, according to tradition in a wheel-race near to where I was born, and had never been molested by anybody, until a gentleman in the neighbourhood, who was a great ornithologist, employed his gamekeeper to shoot this pair. I think the natives of Calcutta were not more indignant when an unlucky Englishman got one of their sacred bulls into his compound, and baited him, than was our little community at what we considered so great an outrage. The gamekeeper narrowly escaped being stoned by myself and some more lads, any one of whom would have shot fifty blackbirds or fieldfares without any misgiving." Mr. Garnett once shot what he afterwards believed to have been a Sabine's snipe.

His interest in the river was not confined to the salmon, and he made some interesting observations on the propagation of lampreys, the spawning of minnows, and the breeding of eels. A short note on the last-named topic, by Mr. Jeremiah Garnett is also printed. On the formation of ice at the bottom of rivers, there are two papers, one by Mr. Thomas Garnett, and the other by his brother, the Rev. Richard Garnett. A shower of gossamer, the thread produced by the aeronautic spider, is recorded as seen on the hills near Blackburn. One of Mr. Garnett's friends was the unfortunate Mr. Joseph Ritchie, of Otley, who accompanied Captain Lyon's expedition to Fezzan, and died there in 1819. To this there is an allusion in the following passage: "In conclusion, allow me to say, that the leisure hours which a somewhat busy life has enabled me to spend in these pursuits, have been some of the happiest of my existence, and have awakened and cherished such an admiration of nature, and such a love of the country and its scenes, as I think can never be appreciated by the inhabitants of large towns, and which I cannot describe so well as in the words of one of my friends, in a beautiful apostrophe to England, when leaving it, never to return.

> "To thee
> Whose fields first fed my childish fantasy;
> Whose mountains were my boyhood's wild delight,
> Whose rocks, and woods, and torrents were to me
> The food of my soul's youthful appetite;
> Were music to my ear—a blessing to my sight."

Why do not more of the dwellers in rural districts employ their often abundant leisure in natural history studies?

THE NEWS OF THE UNIVERSE.

THAT there is nothing new under the sun we know, and we may seriously inquire if there is anything that is new in the universe. That a planet at dewy morning looking in at a window should assume the form of a patriot in the flush of victory or a woman in child-birth, was the savage yearning of the desert child who craved for sympathy, and found it in the gems that shone; and still as the rule of our day-star is replaced by the distant twinkle of the night-watches, an idea possesses us that the seeds of passion are sown broad-cast in worlds unseen, and should a sparkle brighten or grow dim, we experience a thrill of joy or shudder as if a powder-mill had exploded. When it is our own sun that kindles or tarnishes, we instinctively feel and more fully realize that the joys and sorrows, or actual calamities in our companionable planets, are then in unison with our own, and our sympathy might even raise a clamour that the columns of our daily newspapers ought to extend to their coasts their categories of eruptions, cyclones, and famines; so far as rigid statistics show these visitations to be coincident or dependent on the state of the sun's disk: for in any case in so doing we should not incur the stigma of Chaucer's scholar, who predicted Noah's flood at quarter night from the adage of the mighty San Isidro: "Luna si summo corniculo maculas nigras habuerit in primis mensibus, imbres ait fore." One such deluge prophecy, however, on recent lines, it is true, has the repute of being realized. It is singular, says Raikes in his journal, that the old astrologers, prophets, and almanack-makers, all agree in representing the year 1837 of the Incarnation as one of the most calamitous. Galeotti, who lived under Catherine de Medicis, says: "In that year the sun will show itself weak, as if in continual languor, which will prevent it ripening the fruits of the earth." The clear-sighted James Scott also talks of copious inundations that will drown the west, and Vavoust, in his "Spectaculum Mundi," writes in a similar style. M. Arago, taking for his basis the last eclipse of the moon, is of opinion that the bad weather will continue until October. It is needless to add that this being an epoch of a maximum of sun-spots, the sun was actually in the condition foretold; but as regards rain, the previous year in England, according to Symons, had been proverbially wetter. The price of wheat rose.

The transcendental idea in such predictions is, however, the old venerable notion of periods of work and cessation, of kalpas and millenniums, and thus the legendary Christmas-tree, with its bowls, knops, lilies and pomegranates, as it stood obliquely south-east and north-west against the southern wall of the Arab tabernacle, sustained the dignity of the number seven; while its Druid priest, as he contemplated its seven branches perpetually glowing, one by one, like the moon and then known planets with the sun in their midst, mentally reckoned up six days of labour and a Sunday of rest, the seven years of apprenticeship Jacob underwent for a Rachel, and the seven times seven years, hard on the allotted termination of our earthly labours. The astrologically incomplete notion of the harmony of the spheres, and of the metallic globes coursing around the ring of the zodiac to the seven notes of the diapason, modern astronomers have transferred in idea to the central sun-spots, which they suppose to resound with the roar of the typhoon, the crash of the thunder, and the groaning of the earth-throe; a mighty engine at work to prick out a telegram in Stenheil's alphabet, which comes our way to decipher in the form of many-coloured light, heat, and magnetism; which spelt out by the magnet and spectroscope, may allow us to grasp peradventure the switch that sets in motion the universe of lights, that our pioneer telescopes have not yet fathomed. Since we have no idea but length, breadth, and depth, what can be beyond?

As regards the magnets working in observatories, their general movements are undeniably responsive to the degree of spottiness of the sun, but as for the magnetic storms and chronic shakes, they appear to remain as intrinsically a wonder as when commented on by Professor James Forbes in the Dissertation appended to the Encyclopædia Britannica; for while they are known to be simultaneous with earth currents that go forth to course over some considerable portion of the globe, it is by no means absolutely clear whether they come on directly responsive to a big spot, a flash in sun, or to the slower progress of a cold or hot wave over the earth's surface. Though apprised of this incertitude, fondly hoping to catch the faint melody of the spheres concerning which we read, I took down the book of Observations at Greenwich for a certain year during the spring of which the sun-spots, as seen through my small telescope, had dotted off a word on the face of the sun very suggestive of the Mahdi; and I thereupon imagined the magnets to prick off their summer caprice on a scale of music as a piano exercise for certain young ladies, commencing at a rest that coincided with the earthquake at Ischia, and terminating in a dead stillness indicative of the Jovian blowing up of Krakatoa. I was, however, vexed to discover that the first two thermo-electrical bars, unfortunately for the infinities, droned over two coinci-

THE SONG OF THE SUN SPOTS.

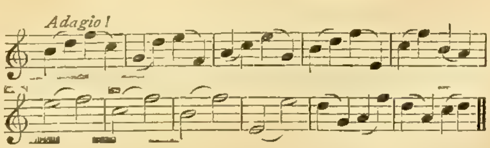


Fig. 107.

dent weeks of summer thunderstorm in England and Europe, and that the carnation glows that came with the yellow leaf were left con amore. I will not send the score, but rather recommend to the notice of the composer the enclosed passage, which presents on the lines of Messrs. Wolf and Ellis the sun-spots and responsive magnetic variation, from the year 1750 until the well-remembered London aurora of 1870; a general jotting of a necessarily processional music, with sudden tremulous and devil-may-care shrieks, that, sweetly tinkling in the delicately pillared shades of Winchester at a harvest festival, might startle aghast the ghost of St. Swithin.

It is at least consoling to suppose our fits of momentary chagrin to be portion of the burden of the spheres; and once when the skaters were figuring on the crisp ice in the London Parks, I fairly came to believe that a black spot that had come round the sun's edge on the sly had been the signal for the thaw and vapoury breathing of the violet-scented, south-western gale. It is an old carp of the salt sea, for Hakluyt quotes the log of the ship 'Richard' of Arundell, bound in the year 1590 for Guinea, to the effect, "that on the seventh, at the going down of the sun, we saw a great blacke spot in the sunne, and the eighth day both at rising and setting we saw the like, which spot to our seeming was about the bigness of a shilling, being in five degrees of latitude, and still there came a great billow out of the southerboard." The cave of Neptune is no longer known, though some tell us it is in the West Indies, and others say it is in the Rocky Mountains, that these whirlwinds gather that rush forth eastwards to attack our American Liners. Having drawn up what Mr. Capron pronounced to be quite a number of coincidences, I ventured to address the managers of the Cunard, Allen, and White Star packets, and suggested that their captains might observe the ingress and departure of the maculæ on the sun's disk as a weather omen. In reply, I received very courteous and practical answers, and a little subsequently I learnt from a leading nautical publisher at Liverpool, that it was thought the gales could be anticipated by telegram. That a sun-spot is calculated to draw a cold line on our atmosphere, may be gathered from the circumstance that when an image of the sun was thrown upon a screen from a telescope in a darkened room by Professor Henry, a spot that happened to be on it, when brought upon the surface of a thermopile, proved to be perceptibly colder than the surrounding light surface. But methinks to fully realize what is transpiring in the sun it would be needful to be transported in a waking vision to the planet Mercury, where eighty-eight of our days close in a rather short year, to rove over its mountains among chromo-landscapes so full of colour, to stray through its valleys of golden amyrinths banqueted on by humming-birds; and dance beneath its dark shadows, or bathe in its misty rivers. As the great dilated sun arose shimmering in the east, we should then peradventure start at the huge black pits crawling over its surface, and commence to prattle about its wrinkles of light and its willow diaper: nay, we might argue from the inverse squares of the distance, whether gravitation were not magnetism, and magnetism the motive power of the universe.* Sad it is to think that while it is possible to learn, and it may be possible to see, what is passing in the planets, we cannot hope through a telephone to interchange a message of kindly greeting. Perhaps in recognition of our unknown brethren we should keep the jubilee festivals of the sun and strike star decorations.

A. H. SWINTON.

* Professor Huxley, in one of his Darwinian orations, states that the harmony of the stars is gravitation; but this is cause, not effect. It will, perchance, explain how the "morning stars sang together," but possibly not why "all the sons of God shouted for joy."

NOTES ON THE INFUSORIA.

By BERNARD THOMAS.

VI.

HYPOTRICHA have the cilia springing from the under or oral surface of the body.

27. *Euplotes patella* is in size about the two hundred and thirtieth of an inch. Front view it is oval, truncated anteriorly, side view it is narrow; it thus somewhat resembles a plate. It has already been remarked that some of the Ciliata have the exudation layer of the ectosarc converted into a cell-wall, but in this species, as well as in Aspidiscus, the transformation is only partial, and we have a chitinous layer on one side protecting the protoplasm and forming a shield or carapace, which is grooved, the lines extending longitudinally. Two of these grooves are very distinct, and are seen just above the cilia which guard the mouth. Around the edge of the carapace there is a row of elevations like

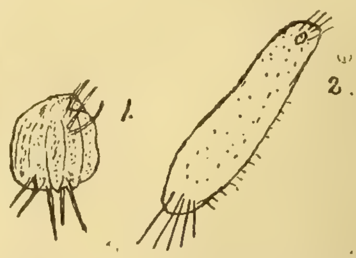


Fig. 108.—*Trichoda lynceus.* 1, Aspidiscus; 2, Oxytricha.

buttons, seen best under a high power. In the posterior region there are four styles. All the cilia are on the under, ventral or oral surface, and can be seen through the transparent carapace. In the anterior region a portion of protoplasm is protruded beyond the dorsal shield, and is covered with cilia. The contractile space is situated in the pos-

terior region of the body. By the use of stains a nucleus, in the form of a bent rod, can be brought into view. *Euplotes patella* is one of the Infusorians that have chlorophyll corpuscles, and as they are few in number they can be easily studied. Each consists of two parts; first, a green cup of chlorophyll containing protoplasm enclosing a colourless ball of the same substance. This is the structure of the green bodies of most, if not all, of the Infusorians.

It is obvious, from a glance at the figure, that Euplotes is asymmetrical. Thus the nucleus is on the left side, and the contractile space and food vacuoles on the right, as viewed from the dorsal surface.

28. Before turning to the Peritricha we will notice

Peritrichous Ciliata.

We now come to a very interesting group of the Ciliata, known as the Peritricha. These fix themselves by a stalk (a prolongation of their body) or by a sucker-like arrangement. Vorticella is one of the most common genera, and may be taken as a type. There is a disc above the mouth fringed with cilia, and a peristome or wall which surrounds the disc and mouth, and which also bears cilia. The mouth is situated below the disc, where this structure rises highest. The œsophagus is sometimes ciliated, and in certain species it is spiral. There is one large contractile space and a nucleus.

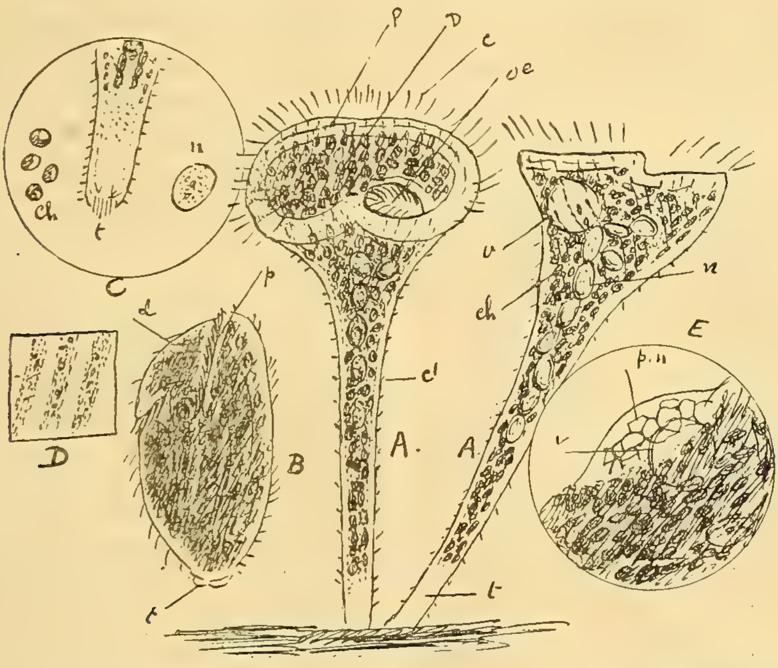


Fig. 109.—*Stentor viridis.* AA, attached and expanded; B, free swimming; C, *t*, tail; *n*, segment of nucleus; *ch*, chlorophyll corpuscles; D, myophan striation; E, part of crushed specimen, to show protoplasmic network (*pn*) and vacuole (*v*). In all figures—*c*, cilia on expanded end; *c'*, on body; *d*, disc; *ch*, chlorophyll corpuscle; *n*, segment of moniliform nucleus; *oe*, œsophagus; *p*, peristome; *t*, hyaline tail; *v*, vacuole. A and B, 1 inch; C and E, ½ inch; D, ¼ inch.

Aspidiscus, which we have previously mentioned. The life-history of *Trichoda lynceus* was worked out by M. Jules Haime. The larval form is known as Oxytricha (Fig. 108, 2), and is heterotrichous. It is somewhat oval in outline, with stiff bristles and cilia. This becomes encysted, that is, it forms a cell-wall round itself, and rests. When the resulting organism escapes from the cyst it is hypotrichous, and was called by Ehrenberg Aspidiscus (Fig. 108, 1) and supposed by him to be a different organism. Like Euplotes, Aspidiscus is furnished with a carapace, from the under surface of which cilia are seen to protrude. The figure gives a better idea of the form of this curious organism than can be furnished by any description.

It must not be supposed that the Vorticellinæ are all permanently attached; on the contrary I have seen a detached vorticella, moving by the aid of its long stalk across the microscopic field. Trichodina can swim easily about by the aid of its long basal cilia, and a Vorticella, recently produced by fission and detached, swims about in a similar manner.

29. *Stentor viridis* (Fig. 109), when swimming covered with its short cilia, resembles one of the holotrichous Ciliata. It is the largest of the Ciliata, and can be easily seen by the unaided eye.

S. Mülleri (Fig. 110) of Ehrenberg, is of about the same size as the chlorophyll-containing species, that is, about one twenty-fourth of an inch long.

S. niger is a black species, and smaller than either of the preceding.

Unattached, Stentor is ovoidal in form. The upper portion, which bears the peristome and closed disc, is broader than the opposite extremity, which ends in a hyaline sucker, by means of which the organism fixes itself to a weed. When Stentor has thus anchored itself it expands, the posterior end lengthening, the anterior broadening, and the peristome opening out, so that it assumes a form which has aptly been compared to a trumpet, and gained for it the name of the trumpet animalcule.

The ectosarc is furnished with short cilia, which cover the whole surface, a small tuft springing from the tail. At the upper expanded portion there is a circle of strong cilia springing from the peristome and ending at the mouth in a spiral.

The myophan striation, readily visible under a low power, is yet more clearly analysed under a higher

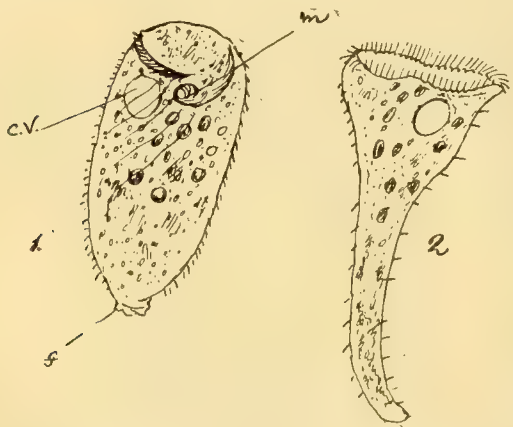


Fig. 110.—*Stentor Mülleri.* 1, free swimming; 2, Stentor expanded; *f*, foot; *cv*, contractile vesicle; *m*, mouth. Low power (1 inch).

(Fig. 109, D). We can then study its nature, and see that it does not merely consist of grooves, but bands of less hyaline alternating with more hyaline protoplasm. A grouping together of the more contractile elements, we may say.

A large contractile space is situated near the peristome, and as in other Infusoria there are here digestive vacuoles and granules, large and small, scattered through the endosarc. Fig. 109, E shows how, by squeezing one of these organisms between slide and cover-glass, an appearance highly suggestive of the network arrangement of the protoplasm, was brought into view. The spaces between the meshes seem to have been widened out.

The chlorophyll corpuscles of *S. viridis* resemble those of Euplotes and the other Ciliata; some are figured. The nucleus is composed of several separate segments placed in a line like a row of beads, and each component resembles an ordinary endoplast (Fig. 109, C, *n*).

Stentor is, I believe, sometimes classed apart from the Vorticellinæ.

30. *Vorticella nebulifera* (Fig. 111) might be well chosen as an example of the whole group. A more detailed description of several interesting particulars, will shorten and facilitate the description of the remaining species.

The bell animalcule consists of an essential portion or bell attached to a long stalk, whose other extremity is fixed to some weed, very often to the stalks of the duckweed. The bell is surrounded at the summit by a wreath of strong cilia. These cilia are placed on a ridge running completely round, and called the peristome (Fig. 111, *p*); inside this there is a disc (Fig. 111, *d*) also fringed with cilia. At a certain point between the disc and peristome there is the mouth, and it is above this orifice that the disc rises highest when the bell expands.

If we look down on to the expanded bell, we see a groove between the disc and peristome which leads to the mouth, and is known as the *vestibule.*

The ectosarc is not very thick or dense, for the outer surface is seen to slightly alter in form. Sometimes one may see a transverse barring or wrinkling similar to the myophan striation before mentioned. A filmy or exudation layer is occasionally observed secreted by the ectosarc. This phenomenon is, I believe, known as "ecdysis." In the specimens in which I observed this feature, the exudation layer was transversely wrinkled and brown in colour. A trace of the myophan striæ is nearly always observed where the bell joins the stalk (Fig. 111, *my*). The endosarc is faintly granular, but sometimes filled with large, strongly refractile bodies (Fig. 111. *g*), which have been called spores, but probably they have nothing to do with reproduction. The nucleus may be easily observed by staining, or by the use of dilute acetic acid; it is a bent rod like a horse-shoe or letter S. In many individuals it is evident without the use of reagents. The stalk consists of a delicate cuticular sheath, through which runs a slender filament of protoplasm.

Having thus studied the general morphology of Vorticella, we will consider the various movements that take place in the different parts of its structure. We may conveniently divide these into—

1. Ciliary movements.
2. Movements that result in the opening and closing of the bell.
3. Movements by which the bell is drawn down.
4. Movements that take place in the internal protoplasm.

1. The *cilia* produce a very powerful current, which draws food into the mouth and also whirls digested particles away that have escaped from the anal area. Elsewhere we had occasion to study the general principles of ciliary motion, and it is unnecessary to enter into them again.

2. With regard to the movements which result in opening and closing of the bell, we have a very complex mechanism. If you watch you will notice that when the stalk shortens, the bell closes and becomes globular. This is effected by the disc being drawn inwards (*i.e.* towards the centre of the cell) by the contraction of the protoplasm below it. At the same time the peristome closes over it and the cilia

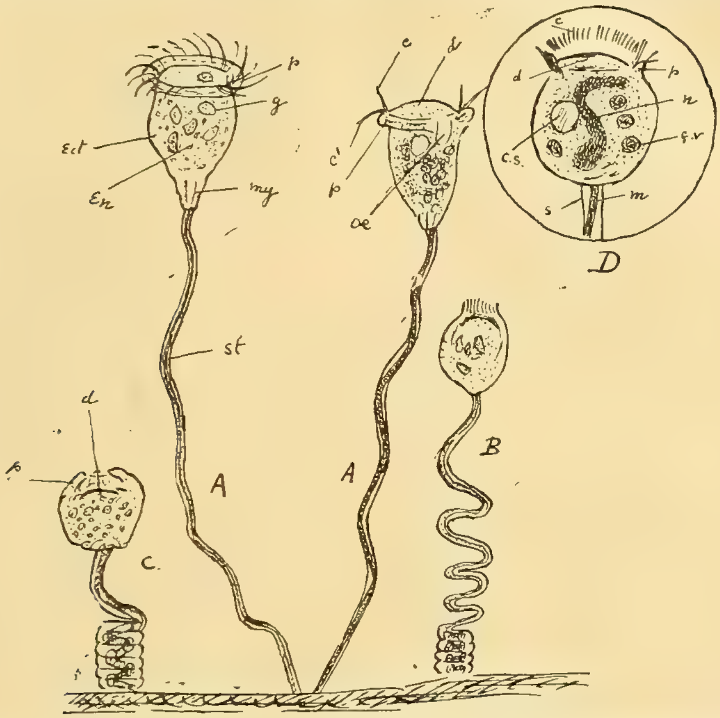


Fig. 111.—*Vorticella nebulifera.* AA, expanded; B and C, contracting; D, stained with methyl violet and more highly magnified; *c*, cilia of disc; *c'*, cilia of peristome; *d*, disc; *cs*, contractile space; *ect*, ectosare; *end*, endosarc; *fv*, food vacuole; *g*, large granules; *m*, muscle of stalk; *n*, nucleus; *oe*, œsophagus: *p*, peristome; *s*, sheath of stalk; *st*, stalk; A, B, and C, ½ inch; D, ¼ inch.

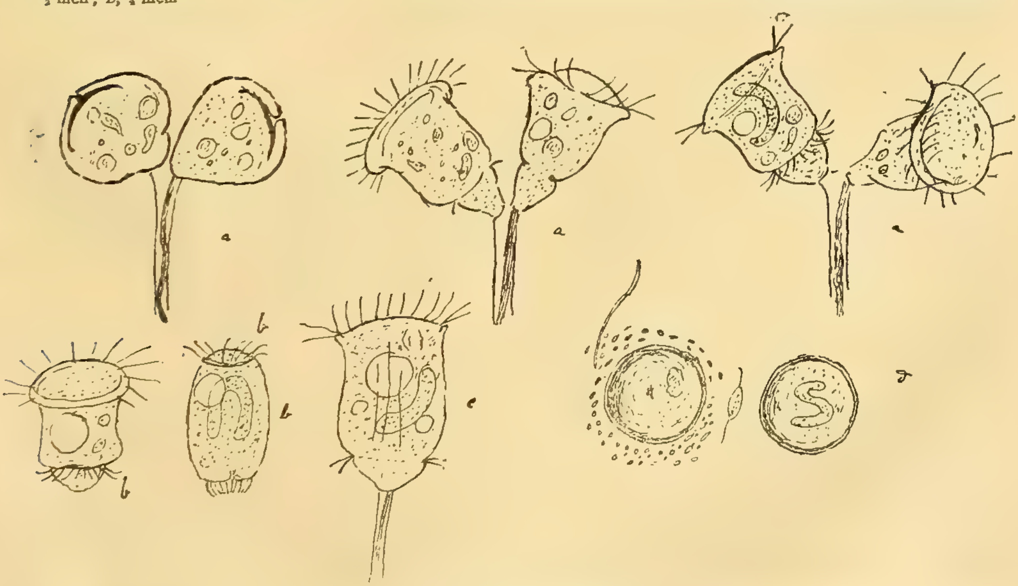


Fig. 112.—*Vorticella nebulifera.* *a*, stages in division; *b*, free-swimming species; *b*, basal cilia; *c*, formation of basal cilia; *d*, encysted species surrounded by bacteria, etc.

may now be seen vibrating somewhere near the centre of the organism. When the stalk begins to unwind, the disc and peristome come slowly out. If while the bell is opening it come into contact with any obstacle, it immediately closes again. There is another movement which takes place when the bell closes, and this is the contraction of the cone-shaped portion of protoplasm which unites the bell to the stalk, and here, as was mentioned, we usually see myophan striæ.

3. The stalk consists of a cuticular sheath, containing a delicate, finely granular thread of protoplasm. When the thread shortens, the sheath is thrown into a close spiral. Contraction is usually effected very quickly, but expansion more slowly. The protoplasm inside the sheath has been called a muscle, and although, of course, it has no muscular structure (properly so called), it is muscular in function and so also are the other essentially contractile portions of the protoplasm, which move the disc and peristome. Perhaps we may look upon these "muscular" portions of protoplasm as due to a collection of the more specially contractile elements in these regions.

4. The internal movements are similar to those seen in other Ciliata. There is a single large contractile space. In a sessile species the interval from systole to systole was thirty-two seconds, and it may be mentioned that a strong furrow was produced in the ectosarc when this organ contracted. The mouth leads into a short, non-ciliated œsophagus, which ends blindly in the protoplasm. Particles drawn into the gullet, sink into the endosarc, and there form food vacuoles. In short, the same description applies to Vorticella as to Parameceum. Vorticella as well as other Infusorians becomes encysted (Fig. 112, *d*). The bell closes and a firm cell-wall is secreted. These encysted bells are free from their stalks, and may be found as little balls of protoplasm, surrounded by a firm cell-wall. A reproductive process by division of the nucleus has been described in connection with encystation.

Reproduction is, however, most commonly effected by fission. In this case the division takes place longitudinally (Fig. 112, *a*). When two bells are thus produced, one of them develops a ring of cilia at the base. The cilia are seen springing from a constriction as small processes. As time advances the basal cilia become stronger and more distinct. Apparently from their first appearance they are vibrating. The new Vorticella furnished with these extra cilia now swims freely about until it finds a spot to fix itself (Fig. 112, *b*).

These basal cilia may be produced in a Vorticella that has not divided (Fig. 112, *c*). Another method of reproduction, in which a small, free-swimming Vorticella (the male) attaches itself to a fixed form (the female), is described as sexual. As a result of the fusion of these and of their nuclei, other smaller individuals are produced.

There are other representatives of this genus, among which may be mentioned:

31. *Vorticella chlorostigma*, whose bell contains chlorophyll.

32. *Vorticella microstomum*, a small and fairly common species.

THE MYMARIDÆ.

As I do not remember to have seen the family of "Fairy-flies" noticed in your columns, I venture to trouble you with this paper, hoping that the subject may attract the attention of abler naturalists than I can claim to be, and lead those of your readers who can boast no higher degree than that of S.G., or "Science Gossip," to many hours of delightful investigation.

The very existence of these tiny beauties, who, however, are our most constant companions in the summer months, is unknown to many who will be delighted to make their acquaintance; so I will at once proceed to introduction by telling them how to discover and catch them, which will at the same time explain something of their nature and habits.

Well, then, being armed with a pair of good eyes, or a pair of good "specs.," as your age or youth may determine, a very small white wide-mouthed phial containing a teaspoonful of pure turpentine or oil of cloves in your left hand, and a light pen-holder or stick terminating with half an inch of a coarse hair or fine bristle, proceed to examine the panes of a sunny window, the lower sash of which is partly open, and if a gentle wind be

Fig. 113.—Fairy Fly. Nat. order, Hymenoptera; family, Mymaridæ; genus, Anaphes, ♂. From "Nature" (not Macmillan's).

blowing towards you so much the better. Very well, you look sharp—but you see nothing! Look sharper still—and you see a tiny entity as small as any dot I could make on this paper with the pen I am holding;—and "it moves," as Galileo once said of something rather larger, and it may be more important. Now hold the wide mouth of your phial about half an inch below him, moisten your bristle with your turpentine or oil, and lightly touch the little creature. If he adhere to the point, at once immerse him: but he may possibly elude your touch and spring backwards into your bottle: or, thirdly, he may justify his claim to the name of "Fairy-fly" by playing you the old fairy-like trick of vanishing altogether "into thin air" or, at any rate, in some direction where you are little likely to find him again. But we will suppose you have secured your prize, or, by good luck, half-a-dozen prizes as good as he. You can examine them at once; or better still, after a mere look at the pretty creatures with a platyscopic or Coddington lens (the former is preferable on account of its longer focus), leave them in the fluid for three or four days, when they will have become more transparent; pour them out into an old-fashioned watch-glass with a flattened bottom placed on a sheet of white paper, and fish them out one by one for microscopical examination—using a two-inch, one-inch, and half-inch objective, and a spot lens, if you have one. Now that you can see your fly, we will set about describing him. As to his family history, it is of the shady description. He is a true parasite of the Hymenopterous group (flies with four wings, two on each side, which are united in flight), having sprung from an egg which his mother had deposited inside the egg of a totally different insect—a butterfly perhaps: a decided liberty to take, surely! However, he emerged in the handsome figure you see him, without any transitions through the grub and pupa stage. Here he is then: Order, *Hymenoptera.* Family, *Mymaridæ.* Genus, *Anaphes*—though what this word may mean, or what may be the meaning of many other bad words which I shall indulge in by-and-by, please don't ask me. The nearest I can get to Mymar is a Greek word meaning "something to eat," but as many millions of Mymars would make but a small mouthful, it can hardly be that. His head is slightly broader than his thorax, and furnished with two antennæ, each of thirteen pieces (the females have fewer joints); two large compound eyes; three simple eyes placed in a triangle at the back of the head, and a horizontal band running between the compound eyes and above the origin of the antennæ.

The thorax gives attachment to the six legs, the tarsi or ankles of which are four-jointed, and to the beautiful wings without veins or nervures. The anterior wings are larger than the posterior, and all are studded with minute hairs, and have much longer hairs on their margins, which are sometimes beautifully iridescent. The hooklets for uniting the wings in flight, and which show so prettily in some of the Hymenoptera (the Bee and Wasp* for ex-

* In these insects the margin of the anterior wing is folded so as to form a trough in which the strong hooklets on the posterior wing are received, and glide in flight. Were they received into holes, laceration would occur, because the two wings arise from different centres, and of course describe different circles when in action.

HYMENOPTERA—MYMARIDÆ.

	Tarsi.	Abdomen.	Antennæ. No. of Joints in ♂ and ♀.	Marginal Branch or Sub-costal Vein situated at base of larger Wings.	Wings, &c.	Genera.
Mymaridæ or "Fairy-Flies"	Tarsi 5-jointed	Abdomen petiolated	♂ 10, ♀ 9.	. . . .	. . .	Camptoptera.
			♂ 13, ♀ 11.	. . . .	. . .	Cöctonus.
		Abdomen sessile.	. . .	Marginal branch extending to middle of costa	. . .	Limacis.
			♂ 10, ♀ 8.	Marginal branch *not* extending to middle of costa	. . .	Alaptus.
			♂ 13, ♀ 11.	Ditto, ditto	. . .	Gonatocerus.
			♂ 12, ♀ 9, club two-jointed	Marginal branch long; tarsi of four hind-legs *shorter* than tibiæ . .	. . .	Eustochus.
			. . .	Marginal branch short; tarsi of four hind-legs *longer* than tibiæ . .	. . .	Doriclytus.
	Tarsi 4-jointed	Abdomen petiolated	Club not jointed . .	. . . .	Forewings only widened near the top . . .	Mymar.
			♂ 13, ♀ 9.	Marginal branch punctiform . . .	Forewings widened throughout	Cosmocoma.
			♂ 10, ♀ 9.	Marginal branch elongated . . .	Metathorax with 2 keels . . .	Caraphrastus.
			. . .	. . . .	Metathorax *not* keeled . . .	Sticothrix.
		Abdomen sessile.	♀ 9 . . .	. . . .	. . .	Litus.
			♂ 12, ♀ 9.	Marginal branch elongated; *thickened* near the top	. . .	Anephes.
			♂ 13, ♀ 9. Last joint 3-fid . . .	Marginal branch linear; *not* thickened near the top	. . .	Anagrus.

N.B.—♂ means *Male*, and ♀ *Female*.

ample) are nearly absent in the Mymars, or only represented by three convergent spines or bristles, which receive the thickened margin of the anterior wing between them. The abdomen in this Anaphes, is sessile; but in many genera of the Mymaridæ it is petiolated, i.e. attached to the thorax by a very slim waist, such a waist in fact as some of our doctors are always preaching against (and rightly too) as displacing the hearts and livers of our wives and daughters. Underneath, in the female, the powerful ovipositor is placed.

These beautiful insects should be mounted in balsam and are so small and slight that many of them require no cell; but beware of pressure when the mount is completed, as they have a very tiresome way of parting with their heads on the slightest provocation.

It is related that the good Bernardin de St. Pierre sat himself down to write a comprehensive history of animated nature, but that happening to look up from his work, he saw on his window-panes such a number of minute flies, about which he knew nothing, that he gave up the idea. I wonder if our little Mymars were among them to enjoy the joke?

I append a short synopsis of the Mymaridæ. It is no doubt very imperfect, but may, I think, prove useful, and in it will be found all the "bad words" which I promised at the beginning of my paper.

The figure of Anephes is drawn from a beautiful mount by Mr. F. Enock, which I have before me.

In compiling this table I have made free use of Foerster's "Synopsis;" and am greatly indebted to Mr. F. Enock, and to my friend Dr. J. W. Gooch of Windsor, for valuable information.

T. E. AMYOT.

FAMOUS COLLECTING GROUNDS FOR DRAGON-FLIES.—VII.

LIST OF BRITISH DRAGON-FLIES, WITH THEIR GEOGRAPHICAL DISTRIBUTION, HABITAT, AND TIME OF APPEARANCE IN THE IMAGO STATE.

By W. HARCOURT BATH, Author of "An Illustrated Handbook of British Dragon-flies," "A Label List of British Dragon-flies," etc., etc.

Name.	Geographical Distribution.	Habitat.	Time of Appearance.
1. *Platetrum depressum.*	England, Scotland, Ireland; common, but local in the north.	Ponds, marshes, canals, fields, lanes, gardens, open spaces in woods, etc.	End of April to end of August.
2. *Leptetrum quadrimaculata.*	England, Scotland, Ireland; common, but local.	Ditto	Middle of May to August.
3. *Libellula fulva* .	England, in the south and south-east; local.	Ponds and marshes . . .	Middle of May to end of July.
4. *Orthetrum cærulescens.*	England, Scotland, Ireland; local.	Ponds, marshes, gravel-pits, roads, etc.	May to September.
5. *O. cancellatum* . .	England; local in the south	Ponds, gravel-pits, brick-holes, canals, and marshes.	End of June to middle of August.
6. *Leucorrhinia pectoralis.*	England; one specimen at Sheerness in 1860.	. . . .	. . .
7. *L. dubia* . . .	England; very local . .	Pools and pits on moors .	July and August.
8. *Sympetrum vulgatum.*	England, Scotland, Ireland; very abundant.	Ponds, canals, gravel pits, open spaces in woods, roads, &c.	May to October.
9. *S. meridionale* . .	England; twice only in the Metropolitan district.	. . . .	. . .
10. *S. Fonscolombii* .	England; thrice only in the south.	. . . .	. . .
11. *S. flaveolum* . .	England, Scotland; very local.	Ponds and marshes, etc. .	May to August.
12. *S. sanguineum* .	England; south, local . .	Ponds, paths in woods, and on roads.	June and July.
13. *S. Scoticum* . .	England, Scotland, Ireland; common, but local.	Ponds and marshes, etc., particularly on moors.	June to August.
14. *Somatochlora metallica.*	Scotland; very local (Rannock Wood in Perthshire)	Ponds.	July.
15. *Condulia ænea.* .	England, Scotland, Ireland; very local, but not rare.	Marshes, ponds, and moist woods.	End of May to middle of July.
16. *Oxygastra Curtisii*	England; very local in the south.	Rivers and streams . . .	Beginning of June to middle of July.

LIST OF BRITISH DRAGON-FLIES—*continued.*

Name.	Geographical Distribution.	Habitat.	Time of Appearance.
17. *Onycho-gomphus forcipatus.*	England; one specimen only	. . . .	. . .
18. *Gomphus vulgatissimus.*	England, Ireland; very local	Streams and rivers . . .	End of May to August.
19. *G. flavipes* . . .	England; one specimen at Hastings in 1818.	. . . .	August 5th.
20. *Condulegaster annulatus.*	England, Scotland, Ireland; local, but not rare.	Streams and rivers . . .	June to August.
21. *Anax formosus* .	England; local in the south	Streams and ponds . . .	June and July.
22. *Brachytron pratense.*	England, Scotland, Ireland; very local.	Ponds, gravel-pits, marshes, etc.	June.
23. *Æschna mixta* .	England, Scotland; very local and rare.	. . . .	July.
24. *Æ. borealis* . .	Scotland; very local and rare (Rannock in Perthshire).	Ponds.	June and July.
25. *Æ. juncea* . . .	England, Scotland, Ireland; common, particularly in the north.	Ponds, marshes, woods, etc.	July and August.
26. *Æ. cyanea.* . .	England, Scotland, Ireland; common in the south.	Open spaces in woods, fields, lanes, ponds, heaths, gardens, etc.	June to October.
27. *Æ. grandis* . .	England, Scotland, Ireland; local, not uncommon in the south.	Ditto	June to August.
28. *Æ. rufescens* . .	England, in the south and south-east, local and very rare.	Marshes and ponds . . .	July.
29. *Calopteryx virgo* .	England, Scotland, Ireland; very common everywhere.	Rivers and streams . . .	June to August.
30. *C. splendens* . .	Ditto	Ditto	Ditto.
31. *Lestes barbara* . .	Ireland (?)	. . . .	. . .
32. *L. virens* . . .	England; twice only in the New Forest.	. . . .	. . .
33. *L. nympha.* . .	England, Ireland; very local.	Ponds and marshes . . .	July.
34. *L. sponsa* . . .	England, Scotland, Ireland; local, but not uncommon.	Ditto	July and August.
35. *L. viridis* . . .	England; once only in the New Forest.	. . . .	. . .
36. *Platycnemis pennipes.*	England, Scotland; not uncommon, but local.	Ponds, rivers, and moist meadows.	June and July.
37. *Enallagma cyathigerum.*	England, Scotland, Ireland; common everywhere.	Ponds, lakes, and moist meadows.	June to August.
38. *Agrion mercuriale.*	England; very local in the south.	Ponds, marshes, and moist meadows.	June and July.
39. *A. pulchellum* . .	England, Scotland, Ireland; common.	Ditto	Ditto.
40. *A. puella* . . .	England, Scotland, Ireland; very common everywhere.	Ditto	May to July.
41. *Ischnura pumilio* .	England, Scotland, Ireland; very local and rare.	Ditto	May to August.
42. *I. elegans* . . .	England, Scotland, Ireland; common everywhere.	Ditto	May to July.
43. *Pyrrhosoma minium.*	England, Scotland, Ireland; very common everywhere.	Ditto	April to July.
44. *P. tenellum* . .	England; very local in the south.	Ditto	May to July.
45. *Erythromma najas*	England, Ireland; very local and rare.	Ditto	Ditto.

NOTE.—The author of the above will be glad to correspond with anyone who is interested in dragon-flies. He will also be pleased to render assistance at any time to readers of SCIENCE-GOSSIP in the identification of specimens, provided stamps be sent for the return postage. His address is Ladywood, Birmingham.

ON THE POPULAR TRADITION THAT COAL EXISTS UNDER BLACKHEATH.

By T. V. Holmes, F.G.S., etc.

MOST persons interested in geology must have been asked the question—"Is there any truth in the old tradition that there is coal under Blackheath?" and have wondered both at the existence of this notion and its wide diffusion. To the geologist the antiquity of this tradition adds much to its strangeness, as it was more or less believed in not merely long before the publication of the views of Godwin Austen on the coal-fields probably lying beneath the Secondary and Tertiary strata of south-eastern England, but long before the very existence of geology as a science.

Many may remember the appearance of subsidences on Blackheath a few years ago. The first disclosed itself on the morning of April 12th, 1878, and in November 1880 two others appeared. That of 1878 and the more easterly of the two later ones were almost identical in size and shape, being shaft-like holes nearly 20 feet deep and 7 to 8 feet in diameter, except near the bottom, where they broadened considerably. The third pit was less deep, and might be briefly described as having a shorter shaft and broader bottom than the two others. An attempt to explore one of the deeper holes was made in 1881, by the Lewisham and Blackheath Scientific Association, but the great expense attending the work compelled its cessation before any decided result could be obtained. The Report of the Exploration Committee was published by the Association in July 1881, no decided conclusions being put forward by the Committee as a whole. To it were appended some Observations by the present writer, pointing out the immense difficulty of any explanation of the subsidences through the mere agency of water alone, unaided by artificial excavations, and showing that the falling in of the shafts of dene-holes such as that discovered in 1878, at Eltham Park, would naturally tend to produce results precisely similar to those presented at Blackheath. It may be useful to add that an account of a visit of the Geologists' Association to Blackheath during the exploration appears in the Record of Excursions published by that Society last year, and that it is illustrated by a map and sections.

The Blackheath Subsidence Committee, during its deliberations, was favoured with communications from all parts of the country, containing such explanations as commended themselves to the writers as the results of their observations in various districts. In addition to descriptions of geological or engineering experiences, the Committee heard of vague popular traditions of underground passages connecting the palaces of Greenwich and Eltham, but no reference was made to any legendary coal-sinkings. Nor were the latter alluded to by the lord of the manor of Blackheath, with whom the Committee was in communication, and who was a subscriber to its Exploration fund. Yet of all persons the lord of the manor was the most likely to have some record of old borings or sinkings in search for coal, had any been made.

However, in 1883, nearly two years after the publication of the Report of the Subsidences Committee, a gentleman who (with many others) applied to the Secretary of the Lewisham and Blackheath Association, Mr. H. W. Jackson, for a copy of the report, mentioned the coal tradition. He wrote:—"It is curious that when I was a boy at school there was some talk of a coal-mine being found on Blackheath which had been forbidden to be worked, as it was said it would interfere with the city dues on coal coming by sea." He added that he first heard of dene-holes in 1819 or 1820. And an archæological friend of my own, Mr. R. O. Heslop of Newcastle-on-Tyne, lately called my attention to the following note in Mackenzie's "History of Northumberland" (vol. i., p. 161; 1825):—

"It is a vulgar error that coals might be dug at Blackheath, near Woolwich, and on other commons near London, if Government had not prohibited their being dug, for encouraging the nursery of seamen, etc. The search for coals in the southern and eastern parts of England has been uniformly unsuccessful. From the immense number and thickness of the known strata which intervene, and which contain no coals or other very valuable matters, it is of no consequence whether coal veins may exist or not in these parts below practicable mining depths. The very open and porous state of some of these strata, the chalks (more than 50 fathoms thick), for instance, occasion them to be so powerfully supplied with water, as to render the prospect of sinking even one shaft through them at London utterly hopeless."

In the above note we have evidence not only that the tradition was known in the north of England early in the present century, but that Government interference was popularly supposed to be the real hindrance to successful coal-mining at Blackheath. The writer in Mackenzie's History, however, possessed sufficient general knowledge of south-eastern geology to prevent him from sharing the view, though his remark that the chalk is more than 50 fathoms thick implies that his information about its thickness was derived simply from the deeper well-sections of his time; for the average thickness of the chalk in the district around London is considerably more than 100 fathoms. Anyhow, the geology of the district seems to have been sufficiently understood in mining circles to have prevented any rash attempts to engage seriously in a search for coal at or near Blackheath, and this, in conjunction with the silence on that subject of the lord of the

manor, gives a strong presumption that no such attempts have ever been made. The "other commons" alluded to by Mackenzie may well have been the others on the Blackheath-Erith plateau, of which those of Woolwich and Plumstead are the nearest to Blackheath.

The supposed interference of the Government to check coal-mining is a tradition, doubtless, of many districts. I remember meeting with it in Cumberland three or four miles S.W. of Carlisle, when endeavouring to trace the boundaries of the Lias outlier there, the district being entirely covered by a considerable thickness of Glacial Drift. A farmer of whom I made enquiries as to wells, etc., told me that he had heard of the discovery of coal at a spot close by his farm, but that it was said that mining had been stopped there by the interference of Government. This patch of Lias consists mainly of dark shales with thin bands of limestone, and, apart from its fossil contents, would naturally be supposed to be Coal-measures coming up from beneath the red Triassic rocks around it rather than Lias (a formation not elsewhere known in the district) resting upon the Triassic beds; for there are plenty of Carboniferous rocks on all sides beyond the red beds. The Lias outlier appears to have been bored for coal at various times during the last 250 years, one boring in 1781, having penetrated through it to the Triassic rocks beneath. And the popular view as to the affinities of its dark shales is attested by the name "Coalfell Hill," applied to a slight eminence within its borders about two miles west of Carlisle.

But at Blackheath and the district around it there can never have been any mystery as to the general geological structure, such as may exist where the older rocks are uniformly covered by a considerable thickness of Glacial Drift, and the surface features throw no light upon the arrangement of the underlying rocks. Few districts, indeed, have a more obvious general structure than that of Blackheath. The plateau, of which Blackheath forms the western end, extends along the course of the Thames from Greenwich to Erith, a variable breadth of alluvium or river gravel lying between its northern edge and the river. On its northern edge sections, here and there, show Chalk at its foot, covered by Thanet sand and the sands and clays of the Woolwich series, the surface being composed of the Blackheath pebble beds, except where these last-named strata are themselves covered by London clay, as at Shooters Hill. It is indeed the immense improbability that a skilled miner of any period could ever have been deceived into thinking coal attainable beneath Blackheath which makes the existence of the popular tradition so remarkable, and so worthy of an attempt to explain it.

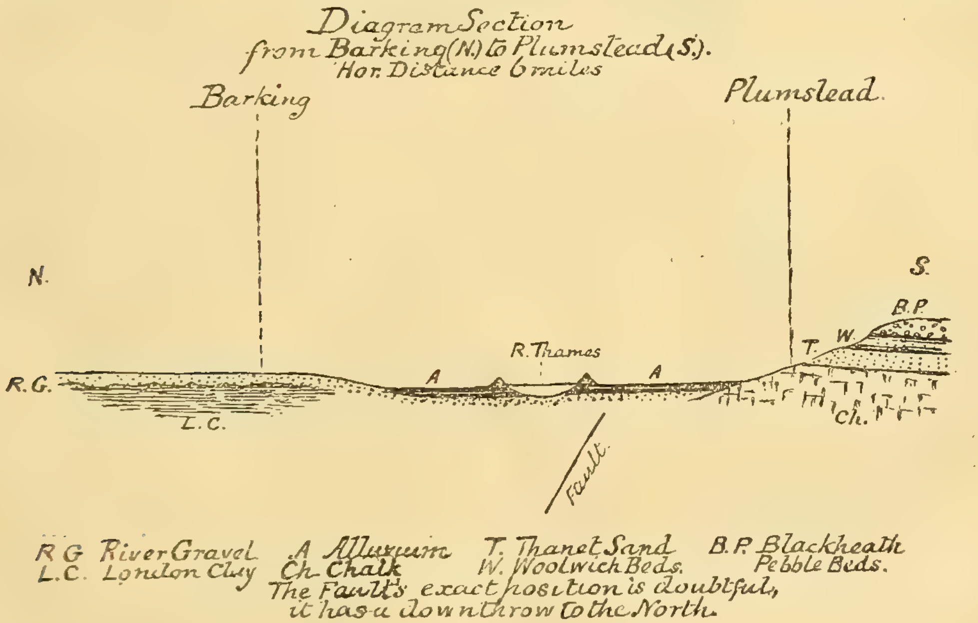


Fig. 114.

In the Woolwich beds which underlie the Blackheath pebble beds, thin bands of lignite sometimes occur, one being now visible at Loampit Hill, Lewisham (about a mile from Blackheath), from three inches to six inches thick. But as the forty feet of pebble beds at Blackheath are represented at Loampit Hill by a pebble band of a few inches only, the natural inference would be that the Blackheath plateau was one of the least likely places any-

where at which a great development of lignite might be expected, the lignite-bearing strata being there represented by pebble beds.

Indeed, it seems to me that no theory based upon the natural inferences of a geologist will explain the existence of the popular tradition. Yet we should certainly expect to find, as in the case of the Cumberland Lias, that it is by no means without an apparent basis in facts, the errors in it arising from a misinterpretation of the facts, not from a disregard for them. And I have little doubt that the true explanation of the tradition is to be found in the following considerations.

Long before the geology of the district was understood, the attention of large numbers of persons must have been drawn to the excavations made for various purposes in the alluvium of the Thames in and near London. These always reveal the existence of large quantities of peat and drift-wood in the mud of the marshes, and as the alluvium must have been dug into from time to time, here and there, during many centuries, wherever the construction of docks etc., etc., made it necessary, the existence of a very considerable thickness therein of more or less coal-like material would be manifest. And not only does the quantity of this material vastly exceed that visible anywhere in the Woolwich beds, but excavations in the marshes must have always been much more numerous and the nature of the beds exposed much better known than those of the other formation.

Of course to the geologist of the present day, who knows that the alluvium of the Thames marshes is confined to the river valley, and that its thickness seldom exceeds thirty to forty feet, the notion that any persons once thought this peaty alluvium a deposit of much greater thickness, not confined to the Thames Valley, and with coal in its lower and more consolidated beds, does not readily occur. But the very difference of our stand-point, in this as in other questions of folklore, is the chief hindrance to our understanding of the way in which the matter would naturally present itself even to the intelligent in the prescientific ages. It is, indeed, generally recognised that the only way of obtaining insight into the meaning of the customs, etc., of primitive man is to learn in what way they are regarded by those who observe them. And as regards the case before us, I was fortunate enough to be able to look through a paper sent to the secretary of a scientific society on coal in south-eastern England, in which the writer dwelt largely on the evidence of the drift-wood, etc., of the Thames marshes, as an indication (if I remember rightly) that coal was, in all probability, to be met with lower down, in the more consolidated beds. I could not get from the paper any definite notions as to the writer's views with regard to the relations between the Thames marsh deposits and the Chalk, but it appeared to me that he did not look on the alluvium as confined to the Thames Valley, but as having a much broader lateral extension. And though he said nothing about Blackheath, it at once occurred to me that this paper incidentally threw much light on the way of looking at things which had given Blackheath its popular reputation as a probable coal-bearing locality.

For if we grant, for the sake of argument, an increased lateral extension to the alluvium of the Thames Valley, both northward and southward, it seems evident that under the high ground of the plateau extending from Blackheath to Erith we might fairly expect to find the southerly continuation of the marsh beds specially well preserved and consolidated. If, on the other hand, we look at the Essex side of the river opposite, we see that on the northern edge of the marshes there is a broad, low flat of river gravel extending to a distance of four or five miles from the Thames. But residents at Plaistow, Barking, Ilford or Romford would know that beneath this river gravel there was nothing but London clay, as their well sections would plainly show. Residents on the Blackheath-Erith plateau, on the other hand, would get their water-supply from the lower part of the Blackheath pebble beds, and never penetrate deeply enough to ascertain whether the drift-wood deposits existed beneath them at the level of the river or not. And as beneath the gravel of London there is London clay at a moderate depth, just as beneath the gravel flat east of the river Lea, it would be evident that if the drift-wood deposits of the marshes, thickened, consolidated and coal-like, were to be met with anywhere under the higher ground bordering the Thames, the most likely spot was decidedly the plateau between Erith and Blackheath.

THE YELLOW ARCHANGEL (*LAMIUM GALEOBDOLON*, CRANTZ).

THIS plant, *Lamium galeobdolon* or *Galeobdolon luteum*, Huds., the yellow archangel, is one of the most interesting and representative of the British Labiatæ. The annexed description is from my note-books, and may be useful and instructive to those who might be unfamiliar with this beautiful "dead nettle."

Ordinal character, Labiatæ. Usually hairy herbs, with stoloniferous root-stocks, stems quadrilateral, leaves opposite decussate, aromatic. Flowers anisomerous, in axillary whorls or verticillasters. Calyx gamosepalous persistent inferior, 5-fid, often bilabiate. Corolla gamopetalous, deciduous, irregular, labiate. Stamens four, or less by imperfection or suppression, didynamous, epipetalous, anthers 2-celled. Ovary deeply 4-lobed, 4-celled, or less by abortion. Style slender, gymnobasic, stigma furcate, ovules solitary, erect, anatropous, fruit constituting indehiscent achænia composed of the component lobes of the ovary.

Generic character, *Lamium*, L. Annual or perennial, more or less hairy herbs; root-stock short; stems square, ascending or erect; leaves petioled. Flowers sub-sessile in axillary whorls; bracteoles linear. Calyx sub-campanulate, 5-fid, sub-2-lipped, teeth spreading, triangular, with cuspidate apices. Corolla bilabiate, ringent, upper lip galeate, lower lip 3-lobed, mid-lobe broad or narrow, lateral lobes smaller, tube straight or ascending; faux dilated, at the base of which is usually the oblique ring of hairs. Stamens four, inner shortest, connivent under the upper lip, which they are as long as, anthers 2-celled confluent, pollen yellow elliptic. Ovary 4-lobed, lobes truncate, triquetrous, style slender, bifurcate, lobes subulate.

Specific character, *Lamium galeobdolon*, Crantz. A perennial hispid or sub-glabrous herb; root-stock very short and nodose. Barren stems prostrate, one to two feet long; leaves ovate cordate, coarsely and irregularly, doubly crenate serrate, acuminate, sometimes cordate, petioles as long as or shorter than the laminæ, lowest leaves sometimes sub-orbicular and longer petioled. Flowering stems erect, ten to eighteen inches high, often sub-terete at the base, and a little sulcate below the nodes: leaves narrower, teeth more distant, and less hairy than those of the prostrate stems, ovate narrowing into the leafy bracts which are almost lanceolate, sub-acute. Flowers in distant whorls, usually 10-flowered, or less by non-development of the rudimentary buds; bracteoles linear subulate, as long as or shorter than the calyx. Calyx sub-campanulate, faintly 10-ribbed, teeth triangular cuspidate, superior one sub-erect. Two lateral divergent, two inferior reflexed. Corolla yellow bilabiate, upper lip oblong galeate, finely pubescent above, and ciliate at its edges: lower lip spotted and streaked with yellow brown, 3-lobed, lateral angular and reflexed, mid-lobe narrow elongate ascending; tube pink, as long as the calyx, faux slightly dilated, and constricted ¼ the corolla's entire length from the base by the oblique ring of hairs. Stamens four, anthers 2-celled, brown, glabrous; filaments villous below, adhesion obscure after the ring of hairs. Ovary 4-lobed, style slender, pink,

Fig. 115.—Structure of the Yellow Archangel.

2-lobed, upper lobe short, lower twice as long, reflexed; ovules erect, funiculus distinct half way up the ovule, micropyle turned towards the dorsum of the cell. Achænia $\frac{1}{10}$ to $\frac{1}{8}$ of an inch in length, brown, wrinkled. Flowers May and June; seeds ripe about one week after flowering. Hedgebanks, woods, and copses, and other damp shady and chalky places; local.

Hairs simple or compound consisting of from one to three cells. Stomata small, about fifteen to the square $\frac{1}{100}$ of an inch, and from $\frac{1}{1000}$ to $\frac{1}{1500}$ of an inch in length, oblong or sub-orbicular; epidermal cells of the upper surface of the leaf irregular and destitute of stomata; epidermal cells of the lower surface more regularly and deeply sinuose. Pollen bright yellow, dehiscent by lateral slits (usually three); extine coloured, twice as thick as the hyaline intine; when immersed in water they become distended (mostly on one side), burst, dehisce their contents, sometimes producing papillæ in the slits, and after the dehiscence and great distension of the membranes the extine is ruptured and thrown off.

HENRY E. GRISET.

SCIENCE-GOSSIP.

MR. W. JEROME HARRISON tells us that, (thanks to the negatives obtained by the Bros. Henry) we are better acquainted with the geography of the visible parts of the moon, than with those of the polar regions, &c. Mr Harrison forgets there are no polling-stations at the north pole!

DR. LESLIE KEELEY, gave an address at St. James's Hall on the 5th of July, on "Drunkenness: a curable disease." Dr. Keeley depends upon his double chloride of gold remedies, both for the treatment of drunkenness and opium-eating.

PART II. of the additions to "English Botany; or Coloured Figures of British Plants," (supplement to the third edition), has been issued by Messrs. George Bell and Sons, York Street, Covent Garden. It deals with the orders XXIII. to XXVI., and has been well compiled and arranged by Mr. N. E. Brown, of the Royal Herbarium, Kew.

THE Museums Association met this year at Manchester from July 5th to 7th, under the Presidency of J. Willis Clerk, M.A, Registrary of the University of Cambridge, and appeared to have a good time of it. The President for the next year is Professor Boyd Dawkins, M.A., F.R.S., Professor of Geology in the Owens' College.

HOLIDAY seekers with natural history tastes need not be hard up either for companions or localities. For instance, that popular society the Geologists' Association goes this year, under the direction of Professor Blake, for a week's geologising to North-West Carnarvonshire and Anglesea. A jollier party could not have been gathered together.

THE last number of the "County of Middlesex Natural History and Science Society," contains the following capital paper, entitled, "On Rabies; its Natural History, and the Means of Extinguishing it," by Arthur Nichols, F.G.S., F.R.G.S. We are sorry to see that the council of the above society were obliged to suspend their meetings until further notice.

THAT active society, the Yorkshire Naturalists' Union, held their ninety-eighth meeting at Penistone, for Dunford Bridge and the upper valley of the Don, on Saturday, 9th July. The geologists were under the leadership of Mr. James W. Davis, F.G.S., etc. The naturalists, under the guidance of Messrs. Alfred Clarke, J. S. Dransfield, and S. L. Mosley, visited the Dunford Bridge Reservoir.

PERCY BYSSHE SHELLEY was born at Field Place, near Horsham, Sussex, on August 4th, 1792. The centenary of his birth is, therefore, close at hand. As Shelley was the foremost man Sussex has given to the world of letters, the county has naturally taken the lead in organising a Centenary Celebration. Meetings have been held at Horsham, and an influential committee, fully representative of the town and neighbourhood, has been appointed. At a meeting of this committee, it was decided that, both on general and local grounds, the most fitting memorial to the poet would be a "Shelley Library and Museum," to be established at Horsham.

THE July number of "The Journal of Microscopy and Science," edited by Alfred Allen, contains the following interesting papers:—"The British Freshwater Rhizopods," "The Bacillus of Diphtheria," "Notes on the Collection and Examination of Pond Life," "Parasites and Parasitic Diseases of the Domesticated Animals," "Methods of Preparing Sections of teeth," etc., etc.

SCIENTIFIC Book Catalogues are always interesting, as well as those which deal with old books other than Scientific. We confess to the additional enjoyment of a pipe when we peruse "The Book-Lover's Leaflet," published by Pickering and Chatto, 66, Haymarket, London. Scientific literature is now assuming an historic form, and early works are being sought. We strongly recommend our readers who are thus-wise inclined, to apply for the "Catalogue of Mathematical Works," offered for sale by Messrs. Dulau & Co., 37, Soho Square, London. We have also received Messrs. Wesley & Sons, No. 117, "Natural History Circular," always welcome.

IS it not Grant Allen who has sketched for us a toothless and hairless descendant? Fancy the house

of Commons, 1000 years hence, full of such people! Anyhow, men get bald sooner than women, soldiers and policemen sooner than civilians, and long before sailors. Is this not attributable to the difference in their head-dresses? Nothing has produced premature baldness among young men more than deer-stalkers and chimney-pot hats. When the head is not confined within such a limited area of ventilation, as in the delightful aerality of women's bonnets, it grows all right, or, at any rate generally keeps on.

NEVERTHELESS, even on women's heads, the hair is not always strong, nor does it always keep on, if we are to judge by the profusely illustrated advertisements in the "Queen" (which inform men so literally and almost shame-facedly how women are made up!) Hair is evidently getting thinner on people's heads—men's first, but on women's also. The purer (as we call it) we make our bread, which literally means the whiter, the less nutriment remains for teeth and hair. Sir James Crichton Browne has just delivered an address on "Tooth Culture," in which he showed that dental caries was related to the change in our method of making bread. Teeth require *fluorine* (so does hair), and it is only the bran, or husk, of wheat which supplies it. Therefore our modern method of carefully getting rid of this must result in a hairless and toothless race of men and women. Whilst teeth are forming in children it is especially essential that whole meal or brown bread, or oatmeal porridge, be given them. It is "Scotia's halesome food," and in what other country do you find men with such bushy locks, flowing beards, or sound teeth?

THERE is a "red spot" on the surface of our big brother-planet Jupiter which for a dozen years past has much exercised the attention of astronomers. The fact is, Jupiter is a world which has not cooled down sufficiently into the "black heat" stage, but still glows in places, chiefly near its equator, with natural fires. The "great red spot" is a demonstration of this fact. It moves about like an iceberg, and has an area perhaps equal to that of the earth's surface. Recently a French astronomer very ingeniously employed one of Jupiter's satellites or moons to measure the "red spot" by.

SOME sparrows have again taken advantage of the shelter afforded by the recesses in the statues erected in the gardens fronting the National Liberal Club on the Thames Embankment to build their nests. Not only has the armpit of the Bartle Frere statue been utilized this year, but another family has a home behind the legs of the gallant Outram.

THE Suez Canal is capable of admitting other things through its monotonous eighty miles than ships and steamers. Cholera uses that short and narrow watery highway as well to pass from the tropics and equator to Southern Europe. Last January a conference was held in Venice to prevent cholera from penetrating into Europe through the canal. This year we are in for a hot summer evidently, and much suppressed fear is entertained lest cholera should take advantage of it. The Venice Conference of January last wisely adopted a system chiefly advocated by the French delegates. This system was practically tested on the Pyrenean frontier during the terrible outbreak of cholera in Spain two or three years ago. On that occasion passengers' linen was disinfected in heating-ovens by steam under pressure, and all the cholera patients (real and suspected alike) were isolated. It has been demonstrated that it is practically impossible for a vessel to pass the Suez Canal in quarantine without contact with the shores. Consequently, it was resolved that no vessel should be allowed to pass into the Mediterranean unless it was either free from infection or had been completely disinfected. Therefore, vessels from the East are to have a perfectly free voyage if they have no cases of cholera on board. Those which have had choleraic cases, but none for seven days before arrival, will be allowed to pass the canal in quarantine if they have a medical officer and a disinfecting stove on board. If not, they will be retained at the entrance to the canal, where a sanitary station is being erected, and where disinfection will take place. The patients will be disembarked and isolated, and the vessels will be disinfected. During the last five years about 16,000 vessels have passed through the Suez Canal. It is satisfactory to know that science is the watch-dog of civilization.

NATURALISTS invariably find that in countries where the struggle for existence is less severe, they may expect to find early types of animals surviving, which elsewhere, where the battle has been most bitterly fought, are extinct. Thus lemurs aud civets are not uncommon in Madagascar—a large island early separated from the African continent—whereas, as long ago as the Eocene period (which must have been nearly two millions of years back), they were as abundant in France, and are found fossilised in that country. In Madagascar there still lives a peculiar rare bird called after a distinguished naturalist, Hartlaubia, which possesses a remarkably intermediate position among groups of birds widely separated. A similar fossil bird has also lately been discovered in France. It lived there ages ago, and for ages has been extinct all over the world except in Madagascar.

"PEACE hath its victories no less renowned than war," and its heroes also. Science is dogged as well as courageous, and it is the doggedness that does it. Last year a valorously brave attempt was made to establish an observatory on the top of Mont Blanc. The difficulty is inconceivable; likewise the hardships which the voluntary scientific martyrs living there would have to endure. Longfellow's youth in

"Excelsior" would hardly do for such a situation. Last year's efforts failed, but a second attempt is being made under the direction of the veteran French astronomer, M. Janssen, who is determined to erect a wooden building on the frozen snow of the mountain. It is to be about 26 ft. long, 17 ft. wide, and will consist of two rooms. This building will rest on six screw-jacks, so as to restore any disturbance caused by changes in the snow. Indeed, the building is now actually being made in Paris, and will shortly be transferred thence in sections to Switzerland, and hauled up to the place appointed from Chamounix. On the top of Mont Blanc the astronomer will be 15,000 ft. nearer the stars, and above the lower strata of the earth's atmosphere, in which clouds and rains are manufactured.

MR. SUTTON, the well-known grass seedsman, and Dr. Frankland have been investigating the relative amount of nourishment of the best kind contained in grasses. The results will be received with some surprise by agriculturists generally. They find that the best hay is made from grass that is only seven or eight inches high. It contains the richest store of nutriment at that stage. Moreover, the grass cut, tends to grow better and stronger. Even when grass is in the flowering state only, the experimenters found a very great difference in the nutritious properties of the hay made from it and that from the young grass above mentioned. Of course when the grass has passed into its seeding stage, its nutritious properties have considerably decreased, whilst it has become very much more indigestible.

PROFESSOR FRANKLAND in his lecture at the Royal Institution on micro-organisms connected with the soil, showed not only their power of nitrifying it, but also, quite contrary to hitherto accepted beliefs, that some of them can undergo enormous multiplication even in ordinary distilled water. The process of nitrification in the soil is the work of two independent organisms, one of which converts ammonia into nitrous acid, and the other nitrous acid into nitric acid. Professor Frankland appears to think that the immense deposits of nitrate of soda in the rainless districts of Peru and Chili represent the result of a gigantic nitrification progress. Close on half a million tons of nitrate are annually imported into Europe, all of which may have been rendered possible through the existence of these nitrifying microbes. What does the great Nitrate King (Colonel North) say to this scientific statement of the origin of that vast wealth which enables him to spend so much money in trying and failing to win the Derby.

A VERY interesting and profitable paper on English climatology has been read at the Meteorological Society by Mr. F. C. Bayard. He proved (what has long been known) that seaside places are warm in winter and cool in summer, whilst at inland stations the reverse is the case. The highest temperature both inland and along the coast is in July and August, and the coldest in December and January. Contrary to what many people would suppose, seaside places are not so humid as inland. The cloudiest district in England is the south-west, and the least cloudy (during the summer months) is the southern. Again, contrary to general opinion, April is the *least* rainy month in the year, and November the heaviest. The amount of rainfall is greatest in the west and least in the east, and gradually decreases across England from the former to the latter coasts.

OF all the artificial manures the farmer has to employ in the growth and development of the plants he takes under his charge, nitrate of soda is the one which ought to be most specially studied. It depends upon the intelligence of the farmer as to whether it should do service as an enemy or as a friend. At present these nitrates come from South America, where it is believed they were accumulated under special climatal conditions by the action of microbes, and subsequently leached out into beds. This suggests the idea that it is possible for a farmer to grow his own nitrates without buying any from his manure merchant. For many years past it has been an established rule of fact amongst English farmers that cereal crops always grow best on land which had previously been occupied by clover, trefoil, peas, or some other leguminous crop. After the latter had been cropped, the soil was found to be actually richer in nitrogen than it was before. This led the late Professor Ville, the distinguished scientific agriculturist, to believe that the lugiminosa had the direct power of tapping and assimilating the nitrogen of the atmosphere. The clever idea is now known to be correct. It is not the leaves of leguminous plants, but the roots, which do the work of nitrification. The latter are crowded with minute wart-like lumps, which are simply so many nests of bacteria. It is the latter which nitrificate the soil, and somehow or another they and the luguminous plants get on better than any other. It is just on the cards, therefore, to be possible for a scientific farmer to grow his crops in such a successive order that he need not buy any nitrate of soda, but artificially produce it on his own land instead. In a most thoughtful and suggestive paper by Mr. F. W. Burbidge, the distinguished curator of the Dublin Botanic Gardens, recently read at a meeting of the Horticultural Club, he says, speaking on this subject, "especially should the cultivator take note of the modern observations as to the storage or fixation of atmospheric nitrogen by bacteria that inhabit the root-nodules of many leguminous plants, such as peas, lupins, clover, etc., for we may some day grow our own nitrogen far cheaper than we can buy it from Colonel North or the vendor of manures."

MICROSCOPY.

SECTIONISING HYDRA VIRIDIS.—It seems rather singular that Mr. H. J. Frederick has been unsuccessful in his experiment. Perhaps if he had taken the precaution to put the sections in a small bottle or test-tube, being careful to exclude any of the Hydra's enemies, he might have reared his colony. About five years ago I tried the experiment of growing the Hydra from sections. I cut a large and vigorous specimen into about ten pieces, and placed them in a small test-tube with water drawn from the household tap; in two or three weeks, eight out of the ten pieces had developed in full-grown vigorous Hydræ. Of course I was careful to exclude all such things as Cypris and Cyclops, and everything that seemed likely to prey upon the undevoloped sections, and also allowed plenty of water, so that there was no risk of the oxygen becoming exhausted, a rather important feature where animal life is concerned, either in development or prolongation. Did Mr. Frederick omit to take note of that consideration?—*F. J. George, Chorley, Lanc.*

JOURNAL OF THE ROYAL MICROSCOPICAL SOCIETY.—The June number of the above journal, in addition to its valuable summary of current researches relating to zoology and botany, contains the following original papers (illustrated): "On a series of Lantern slides, Photomicrographs and Photographs of Photomicrographic Apparatus," by A. Clifford Mercer, F.R.M.S., "The Foraminifera of the Gault of Folkestone," by Frederick Chapman, F.R.M.S., and "The Penetrating Power of the Microscope," by Edward M. Nelson.

ZOOLOGY.

THE NATURAL HISTORY OF BEDFORD PARK.—The Bedford Park Natural History Society has had in hand a list of the fauna and flora of that locality, and as a considerable number of forms have now been catalogued, it may be of interest to some to see what may be found in a locality so near to London as Chiswick, considerably less than a square mile in area. Of plants we have at present recorded 168 species and one variety, of which the following are the more interesting:—*Ranunculus ficaria*, *Papaver argemone*, *Erysimum cheiranthoides*, *Nasturtium officinale*, *Diplotaxis muralis*, *Reseda luteola*, *Viola tricolor*, *Galium palustre*, *Sagina nodosa*, *Silene inflata*, *Lychnis flos-cuculi*, *L. vespertina*, *Agrostemma githago*, *Linum usitatissimum*, *Hypericum quadrangulatum*, *Malva rotundifolia*, *Geranium dissectum*, *Trifolium hybridum*, *T. procumbens*, *Lotus major*, *Melilotus officinalis*, *Vicia cracca*, *V. hirsuta*, *Lathyrus pratensis*, *Rubus discolor*, *R. corylifolius*, *Potentilla recta*, *P. anserina*, *Geum urbanum*, *Spiræa ulmaria*, *Circæa lutetiana*, *Epilobium palustre*, *E. montanum*, *E. parviflorum*, *E. hirsutum*, *Bryonia dioica*, *Apium graveolens*, *Helosciadum nodiflorum*, *Dipsacus sylvestris*, *Chrysanthemum leucanthemum* (var. *minor*), *Erigeron canadensis*, *Achillea ptarmica*, *Artemisia vulgaris*, *Gnaphalium uliginosum*, *Sonchus oleraceus*, *S. asper*, *S. arvensis*, *Arctium lappa*, *Pulicaria dysenterica*, *Calystegia sepium*, *Solanum dulcamara*, *S. nigrum*, *Scrophularia aquatica* (var. *Erharti*), *Prunella vulgaris*, *Stachys sylvatica*, *Ballota nigra*, *Myosotis arvensis*, *Anagallis arvensis*, *Polygonum amphibium* (var. *terrestris*), *P. aviculare*, and var. *erecta*, *P. persicaria*, *P. convolvulus*, *Euphorbia peplus*, *Urtica urens*, *Cannabis sativa*, *Juncus bufonius*, *Poa annua*, *Phalaris canariensis*, *Phleum pratense*, *Bromus mollis*, *B. sterilis*, *Lolium perenne*, *L. italicum*, *Agrostis vulgaris*, *Dactylis glomerata*, *Aira cæspitosa*, *Hordeum pratense*, *Alopecurus pratensis*, *Anthoxanthum odoratum*, *Equisetum arvense*, *Fumaria hygrametrica*. Most of these are common enough in the open country, but it is interesting to find them in the metropolitan district. A few were represented by only single specimens, and a few others are probably not truly wild. For the names of many of them I have been indebted to Mr. G. Nicholson, of Kew. Among the Invertebrata we have thirty-four species of mollusca, and numerous species of insects, some of which have been already recorded ("Entomologist," 1885, p. 247), as well as a few crustacea, *Oniscus murarius*, *Armadillo vulgaris*, *Gammarus pulex*, *Candona reptans*; five myriapoda, which appear to be *Polydesmus complanatus*, *Julus terrestris*, *J. londiniensis*, *Geophilus longicornis*, and *Lithobius forficatus*; several spiders, a leech, and the common worm, *Lumbricus terrestris*. The mammalia are confined to *Homo sapiens*, a species of bat not yet captured, *Mus musculus*, and *M. decumanus*. The birds are thirty-eight, and include *Muscicapa grisola*, *Regulus cristatus*, *Parus major*, *P. cæruleus*, *Turdus viscivorus*, *Ruticilla phœnicura*, *Phylloscopus sibilatrix*, *P. trochilus* (the last three were seen by Mr. R. B. Sharpe), *Curruca cinerea*, *Sylvia luscinia*, *Cuculus canorus*, *Cypselus apus*, *Hirundo rustica* (apparently rare, though the martin (*Chelidon urbica*) is common enough), *Parus ater*, *Emberiza citrinella*, *Yunx torquilla*, and stray specimens of *Perdix rufa* (one caught during the recent frost, and now in the possession of Mr. J. Gray), *Ardea cinerea* (flying overhead), *Scolopax gallinago* (Rev. J. W. Horsley), and *S. rusticola* (seen by Mr. Hargitt). The amphibia consist of the frog (*Rana temporaria*), the toad (*Bufo vulgaris*), and *Triton tristatus*, which last is generally thought by the natives to be a sort of lizard.—*T. D. A. Cockerell.*

NEW VARIETY OF HELIX ARBUSTORUM.—I have the pleasure of forwarding and recording the description of a most unusual variety of *Helix arbustorum*, taken with many other interesting forms of this

variable species in the neighbourhood of Clitheroe, Lancashire, May 14th, 1892. Shell conical, pale pink; interior of aperture on the antepenultimate whorl, yellow; extremely thin, transparent, delicate, mottlings somewhat subdued, bandless.—*R. Wigglesworth*, 13 *Arthur Street, Clayton-le-Moors, Accrington.*

BOTANY.

Remarkable Specimen of the Tway-blade Orchis.—We have received from Mr. F. J. Provis, Coleford, Gloucestershire, a specimen of the Tway-blade (*Listera ovata*) in which the three leaves belie the common name. It is doubtful whether we should ascribe such a departure from the normal type of the plant to reversion or otherwise, but we should be glad to hear if any of our readers have come across similar specimens.

Fig. 116.—Remarkable specimen of *Tway-blade.*

Practical Botanical Queries.—Will some correspondent kindly answer the following questions in Science-Gossip?—(1) Can Botanical Paper that has been used for drying plants be used a second time? (2) I find it noted in your book of "Notes on Collecting and Preserving," that a weak solution of alum painted on the flowers will preserve their colour. About what strength should the solution of alum be, and should the flowers be painted before putting in the press?—*E. P.*

Morphological Notes on some of the Ranunculaceæ.—After a careful examination of several of the common genera of Ranunculaceæ, I cannot help thinking that botanists have made a slight muddle in their use of the terms "involucre," "petal," and "sepal" with regard to them. In a letter to "Nature," December 3rd, 1891, I pointed out, and, as far as I know, no one has disputed it, that the so-called involucre of the anemone (*coronaria* or *nemorosa*) was really a calyx. I had not then noticed that the term "involucre," was also applied to the leaf-like sepals of *Eranthis hiemalis*, the term "sepal" being used for the yellow petals; whilst, forsooth, the nectaries within were honoured with the name of petals! These nectaries are, unless I am much mistaken, homologous with the scales at the base of the petals of *Ranunculus bulbosus*, the only difference being that in this case the nectaries are united with the petals, in the Eranthis they are free. If this opinion should prove correct, the *Helleborus niger* would have to be considered as without a corolla; for its nectaries are evidently the homologues of those of the Eranthis. While on this subject, I would suggest that the term "involucre" should be used simply of agglomerations of bracts, such as we find in the Asteraceæ (Compositæ); and that the term bract should be restricted to those leaves from the axils of which the floral branch theoretically springs. Then, if I am wrong in terming the leafy appendages of the scape of the Eranthis sepals, it would be necessary to invent some new term to describe them. Now that the Aquilegia is in flower, I should like to call attention to a remarkable feature in it. In the centre of the flower, within the stamens and surrounding the carpels, exists a whorl of ten, representing, I suppose, two whorls of five, minute colourless leaves; for leaves they must be, morphologically speaking, though they are too small and

hidden to discharge the functions of ordinary leaves. What their use can be, I cannot guess; and if they are simply modified or degenerate stamens, their position is notable, since it is amongst the outside stamens one is accustomed to find such, as in the peony, rose, water-lily, etc. I should be grateful if any reader of SCIENCE-GOSSIP could throw some light on this subject.—*H. St. A. Alder, Gt. Malvern.*

GEOLOGY.

THE RELATION OF GEOLOGY TO ARCHÆOLOGY.—At the Annual Summer Excursion of the Suffolk Institute of Archæology and Natural History, Dr. J. E. Taylor, Ed. "S.-G." (hon. member), delivered an address on this interesting and original subject, dealing chiefly with the churches of Suffolk and Norfolk. He pointed out that in the Australian colonies we might see the evolution of church architecture condensed into little more than a quarter of a century, just as a red deer annually reproduced in the increasing number of its tines the evolution of its race. In an Australian bush-town the first church would be built of wood, as was the case with nearly all the Saxon churches in this country. In a few years it would have a roof of corrugated iron, then would come the stone period, replacing the original structure, and perhaps on the identical spot, owing to its having been consecrated. Our early churches up to shortly before the Norman period were built chiefly of wood. England was a forest-clad country, and wood must have been the chief quarry, except in freestone and limestone districts. Although East Anglia was one of the early settled districts, there must have been considerable difficulty in conveying large quantities of stone inland. Hence we find that in the districts of Norfolk, Suffolk, and Essex, where the sub-soils were boulder clay, the stones for church building were collected on the spot, turned up by the plough or picked off the ground. The external form of tower, into which they could be most easily worked, would be a round tower, and there were more round tower churches in Suffolk and Norfolk than all the rest of England put together. A modification of these occurred later on, when the upper part was made octagonal, each angle being strengthened by freestone. The highly artistic stone-work of the later Norman period, as well as that of the Early English and Decorated styles, were possible, because the Oolitic limestone used for that purpose was worked almost as easily as cheese, when freshly quarried. This was brought over chiefly from Caen, in Normandy, for use in the eastern parts of East Anglia. Further west we got more Barnack stone, from the village of that name, in Northamptonshire. The Abbey of Bury St. Edmund's, which was originally a huge wooden structure, was rebuilt chiefly of this stone, King William foregoing his tolls on this occasion. It was singular how certain kinds of stone had come to be used for special church-work. Thus the fonts, altar slabs, etc., were frequently formed of Purbeck marble, a fresh-water limestone, crowded with fossil shells, only found at Purbeck. During that great church-building epoch, known as the Perpendicular period, the outlying buttresses, clerestoried windows, and other elaborate work demanded a greater use of Oolitic freestone, and this was probably the reason that at the time it was most abundantly used. The later Perpendicular and Decorated churches in districts where the black flints could be obtained directly from the chalk allowed of those flints being faced and squared, and this led to the lovely flint and panel-work seen at its best perfection at Norwich, both in ecclesiastical, municipal, and other buildings. It would have been impossible for the shattered flints obtained from the boulder clay, where they had originally been deposited by ice-action, to have been worked in this manner. Accordingly we find the latter used in all churches down to the Tudor period, just as they were found, so that our East Anglian churches were capital geological museums, containing stones, chiefly flint, from all the geological formations between here and Scotland. The early Romans availed themselves of those masses of argillaceous carbonate of lime, which occur in the London clay and are know as Septaria. The Roman wall at Colchester is built chiefly of them, so is the Keep at Orford Castle, and many of the high-towered churches along the Suffolk and Essex coast have this stone in their composition, especially when the London clay happens to crop out in the district. These Septarian stones are common along the southern parts of the Suffolk coast. The West Rocks off Harwich are formed of them. Dr. Taylor also referred to the Carstone churches in West Norfolk, and to the hard Coraline limestone which only occurs in the neighbourhood of Orford, which must have affected church architecture; and how hard put to it the church builders must have been, in a district where no natural quarries are found, to obtain the materials wherewith to build the grey old churches of our towns and villages, of which East Anglia can boast to possess the most splendid and well preserved.

THE RED MOUNTAINS OF SUTHERLAND.—On perusing one of the scientific journals for this month, a very satisfactory bit of information was learnt by me for the first time. It seems that in No. 297 of SCIENCE-GOSSIP (September 1889), in the course of an article on the geology of Sutherland, I suggested the idea that the so-called Cambrian rocks of that county were really of igneous or volcanic origin, *i.e.* that they occupied a lower position than the Cambrian formation which is supposed (I believe wrongly) to be composed of metamorphosed marine sediments. Now it is a fact that the officers of H.M. Geological

Survey have in the summer of 1891 actually proved that the Torridon sandstone—the equivalent of the strata which form the red mountains of Sutherland—is really of a pre-Cambrian age. These pre-Cambrian rocks are universally allowed to be of a volcanic origin; so that my original contention seems now established. The history of the stratigraphical determination of these Sutherland pre-Cambrians is rather amusing. Nicol and the eloquent rhetorician, Hugh Miller, called them Devonian. Murchison soon afterwards referred them to the Cambrian system; while now from the summer of 1891, the Survey, after much bungling, mathematical scratching, and a sort of trembling hesitancy on the part of that splendid rhetorician, Sir A. Geikie, have at last definitely assigned the position to which anybody not too densely stupid, would have immediately relegated them at first sight. It seems, however, that Professor Judd has uniformly regarded them as pre-Cambrian, an opinion which I had never heard of till this month, and one which, for aught I know, has subjected that scientist to a fierce hurricane of inimitable rhetoric from the matchless pen of his inveterate opponent in the various interesting geological problems anent the north-west highlands.—*Dr. P. Q. Keegan.*

NOTES AND QUERIES.

A Poughkeepsie inventor, Mr. Mulrey, has devised an ice locomotive, or, rather, a steam engine attachment for the ice-boat, which will make it independent of the wind. The boat he uses is of the ordinary ice-boat form, is provided with a small boiler carrying 250 lb. pressure of steam, and a small engine working on a pair of cogged drivers. Some experiments with this vehicle made on the Hudson river just before the breaking up of the ice were fairly successful.

An eminent Prussian ornithologist, who has been making a series of curious experiments, states that cayenne pepper in the food of canary birds is known to change their colour slowly from yellow to red. In addition to a colouring substance, this pepper is found to contain an irritating principle and an oily matter, and as extraction of the two latter principles removes the effect upon the plumage of birds, and the subsequent addition of olive oil restores it, the oily part of the pepper is supposed to be the necessary vehicle of the colour. Wholly white hens were coloured by the pepper food. These hens lay eggs with a very bright red yolk, and themselves possess the remarkable property of fore-shadowing a change in the temperature by a decided change of tint. When fed with alkanet root the birds become violet red in colour.

A Ground Upheaval.—I was witness lately of what to me was a phenomenal sight, and I should be interested to know whether any readers of Science-Gossip have had a similar experience. I was spending Sunday, June 19th, 1892, at a friend's house in Ipswich, and at about a quarter to six p.m. a short and violent thunderstorm commenced. There was a loud clap of thunder, followed almost immediately by vivid lightning, and then a deluge of rain. Suddenly my friend exclaimed, "Do look at the lawn!" and lo and behold from the level turf a mound measuring 42½ inches by 35 across had risen to a height of about 8 inches. We called the rest of the household to see it, and as we watched, two small jets of water burst from one side. Anxious to examine the mound closer, I waded out despite the rain, and found on touching it that it had all the elasticity of an indiarubber ball, and that by pressing it I could squeeze the water out of one part into another. The rain soon ceasing, the upheaval began to subside, and took rather more than a quarter-of-an-hour to sink to its proper level, the turf then wearing a wrinkled appearance, as though it had been much stretched. I confess to a certain disappointment when I afterwards learnt that the cause was not entirely natural, as there was a pipe underneath connected with the roof of the house, and which was intended to carry off the water, that it might there sink into the ground. Nevertheless, the phenomenon was instructive to me as illustrating the probable origin of many inequalities on the earth's surface which are not due to volcanic action. I hope that the matter-of-fact termination to the story will not make it entirely devoid of interest.—*Nina F. Layard.*

A Fatal Fly-Sting.—The sad accident to Mr. Frank J. Woods, is one of rare occurrence, although the conditions for it are only too prevalent. Mr. Woods died, after about ten days' illness, from erysipelas and septicæmia supervening on a sting on the lip inflicted by a gadfly. It was conjectured that the insect must have been in contact with a diseased animal; but the transference of putrescent material from any source may have been made by the gadfly to the wound it inflicted on a highly vascular part. The only thing to be done under such circumstances is to subject the wounded part to powerful suction; and in the case of a bite on the lip this may be done fairly effectively by the individual himself, for only in this way is it at all possible to extract the poisonous material.

Electricity *versus* Caterpillars. — Edison originated electrocution on a practical scale when he waged successful war on cockroaches. We are greater believers in the humanity of electricity as a destroying agent when thus applied than when used punitively for man. We now hear that Edison's original device has been greatly improved upon, and applied to prevent caterpillars from climbing up trees. Alternate wires of copper and zinc are run around the trunk of the tree, at a distance of about half an inch apart. The casual caterpillar begins to mount the trunk of the tree, and unlimbers himself with the confidence and vigour born of an impending feast. Presently he reaches the copper wire, pokes his nose over it, and lets another kink out of his backbone. Half an inch further up his front feet strike the zinc, the circuit is completed, and the unfortunate larva is a martyr to science.

Landscape Scenery.—When on the top of our Breconshire Beacons a short time ago, a friend called my attention to the fact that the colours and outline of the distant landscape were far more vivid and distinct if looked at with the head on one side than in the ordinary way. I have since then observed the same effect elsewhere, and shall be glad if any of your readers can explain why this is so.—*C. Henry James.*

THE ORIGIN OF METAL VEINS.—Some very remarkable observations have been made by Dr. von Steeruwitz, chief of the western division of the Texas Geological Survey, on the genesis of ore deposits. Miniature veins of gold, silver, copper, lead, and other metals, with beautifully-formed agates, are the result of his experiments, which seem to go far to proving that the agency concerned in filling the fissures known as mineral veins was seldom fire, but hot solutions, from which, by the help of galvanic currents under enormous pressure, the contents of the veins were deposited. The refiltration of mineral matter into the neighbouring rocks was in most eases due, he thinks, to a process of "leaching." In the Arizona School of Mines similar experiments are being made by Mr. Comstock, with results which may not only modify many of our old notions, but actually lead to the artificial production of the metals.

FOUND, growing plentifully and in full flower, *Cynoglossum officinale* on June 24, on the sea-shore at Shoreham, near Brighton. Plants very strong and over two feet in height.

SPARROWS ATTACKING GOLDFINCHES.—Colonel Ward, Copdock, Ipswich, writes that, "until recently he had a nest of young goldfinches in an ilex-tree. One afternoon, hearing a great commotion, he looked up, and saw a cock and hen sparrow 'murdering the innocents.' They pulled one young goldfinch out of the nest, and threw it down, and probably killed the others, as the hen sparrow was observed pecking viciously at them. The parent goldfinches were in great distress, but did not attempt to drive the marauders away, and next morning neither sparrows nor goldfinches were there."

FEATHERED CREATURES.—Feathered things seem far more devoted to their young than furred ones. The wiles of many birds to lure the marauder from the nest are familiar to every one. What an agony they are in! Some of the smaller kinds will all but allow themselves to be caught, and the larger ones will face tremendous odds, and win by sheer desperate fury. The old hen is the best example—a wonderful mother though a terrible fool. She will beat off anything smaller than a pig or a fox. But it is not fair to give her ducks to rear, especially wild ducks. Gamekeepers have a senseless trick of taking the eggs from a wild duck's nest and setting them under a hen, with the object of attaching the birds to the place. How is a hen to look after young wild ducks? I remember a nest of ten being handed over in this way to a foster-mother. She hatched them splendidly, and fussed over them as if they were her own; but she could not protect them. One day six disappeared, and a few nights afterwards the rest. We could not make out what had become of them, until one day we saw a litter of stoats running down the lawn. The wretches swim splendidly, and nothing would be easier than to get the ducklings on the pond, while the old hen clucked helplessly on the bank.—*Manchester City News.*

NOTES ON THE CUCKOO.—The cuckoo is generally heard here about the 20th of April; this year he has favoured us more than usual with his two-syllable song; he can be heard nearly all day from early morn till late at night, and he so reminds me of my first experience with the young cuckoo. Many years ago, I, in company with two other boys found a young cuckoo in a hedge-sparrow's nest. Being the first that I had seen I had a great desire to see if I could bring it up in a cage; but I found the same feeling was shared by each of us. The cuckoo was too young to take then: the next question to decide was, who should have it when it was ready? I found I was the less likely to have it by fair means, so I began to consider how I could get it by other means. The next day I might have been seen by the cuckoo nest, planning some scheme to make sure of having it when it was ready. The nest with the cuckoo in was in a hedge about four feet from the ground; I thought, if I take the bird and nest a few yards further along the hedge, and place it in the grass at the bottom of the hedge the sparrow will be sure to find it, and I shall make sure of my cuckoo. I began at once to put my plan into practice, thrust my hand into the hedge to take out the nest and bird; but, lo! I managed to get the bird all right, but the nest was left in pieces, scattered in the hedge. What is to be done now? was the next thought; can I make a cuckoo's nest? surely they are not very particular as they cannot make a nest themselves. I took some of the coarse grass from the bottom of the hedge, and bound it up with a piece of string, made a depression in it and the cuckoo nest was made. Since then I have heard of a man who betted a wager that he could make a magpie nest; but he lost the wager, it was decided against him that after all it was not a magpie nest. However, I put the cuckoo in the new nest, placed it in the grass at the bottom of the hedge, and it was brought up by the sparrow as though nothing had happened. That was my first experience with the cuckoo, but not the last. Since that time I have found three young cuckoos in a single day, and in all sorts of odd places. I have found one in a grape-vine trained to a wall, on the cornice over a window-head, on a porch over a doorway, in a hole in a bank, in heaps of stones; and I once found one in a stack of bricks, which left no doubt as to how the egg was placed there but by the cuckoo's beak, neither could the young cuckoo escape till the bricks were moved. This year I have been fortunate enough to see two clutches of hedge-sparrow's eggs, with a cuckoo's egg among them. The only nests that I have found them in are nests of the hedge-sparrow, pied wagtail, and robin.—*H. Blaby, Brackley, North Hants.*

FLORAL MONSTROSITIES.—The flower of fuchsia frequently exhibits a peculiar departure from the normal form. Two of the petals are missing, but the two stamens—next to the place where the petals should have been—have miniature coloured petals at their apices, and at the same time appear to retain their anthers, still covered with pollen.—*Francis Brent, Tothill Avenue, Plymouth.*

A NEST OF WHITE BLACKBIRDS.—Ornithologists will be interested in the fact that Mr. Charles Wood, chemist, Harleston, Suffolk, has in his possession a nest of white blackbirds (two cocks and one hen bird), which he purchased from a labourer for five pounds. The nest was in a lane not half a mile from Mr. Wood's premises. The trio have now been out of the nest three weeks, and are healthy and lively; they are perfectly white, with pink eyes and yellow beaks.

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

To Anonymous Querists.—We must adhere to our rule of not noticing queries which do not bear the writers' names.

To Dealers and Others.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply Disguised Advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges," which cannot be tolerated.

We request that all exchanges may be signed with name (or initials) and full address at the end.

Special Note.—There is a tendency on the part of some exchangers to send more than one per month. We only allow this in the case of writers of papers.

To our Recent Exchangers.—We are willing to be helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

J. B. Wright.—Your plant is the common goat's beard (*Tragopogon pratensis*), one of our commonest wild flowers.

F. G. Bing.—The sea-weed sent is covered not with "minute egg-cases," but with the empty cells of a common Bryozoan (*Membranipora membranacea*). See Taylor's "Half-hours at the Sea-side," for illustration.

R. W. G.—You had best inquire of W. Harcourt Bath, Esq., The Woodlands, Ladywood Road, Edgbaston, Birmingham, respecting his various works on Dragon-flies, because in England he is our chief authority on this lately sought out department of Entomology.

M. A. Idle.—Any bookseller will supply you with a half-crown volume on the subject you require, and will give you the necessary instruction.

Equus.—You can get from the publishers of Sowerby's Botany (Messrs. George Bell & Sons, York Street, Covent Garden) any volume you like. Write to them.

D. E. F. (Barbados).—The Scientific Circulars and Catalogues issued by Messrs. Dulau, 37 Soho Square, London, and Messrs Wesley & Sons, Essex Street, Strand, will afford you all the information you require.

J. R. (Hong-Kong).—Address Mr. William P. Simmons, Hon. Sec. Microscopical Society, 6 Hastings Street, Calcutta.

J. B. King.—You could hardly do better than present a copy of dear old Kingsley's "Glaucus" to your son; but get a first edition, if possible.

K. G.—Most sea-side railway libraries are now supplied with good and cheap books, relating to the popular Zoology, Botany, Geology, etc., of the locality.

E. Pratt and others.—The question of publishing a complete up-to-date General Index of "Science-Gossip" has been repeatedly raised. With the publishers it is, and must be, a commercial question; but the Editor and his friends of the last twenty-one years know there is no such Natural History Cyclopedia in the world as the volumes of Science-Gossip from the commencement.

EXCHANGES.

Wanted, marine or land shells (foreign preferred), good fossils, or Northumberland tokens. Can offer in exchange foreign stamps.—J. S. Wood, Wood's Buildings, Walker Gate, Northumberland.

Wanted, insect parasites on man or domestic animals, mounted or unmounted. Good exchange given in brilliant insects, or parts of insects.—S. L. Mosley, Beaumont Park Museum, Huddersfield.

Unique collection of boulder clay (upper glacial drift), derived fossils and rock fragments—nearly seventy named fossils—for disposal. Exchange for first-class micro. apparatus, or offers. List sent.—Fisher, The College, Gildersome, Leeds.

Wanted, *Unio pictorum*, *Limnæa auricularia*, *Cyclostoma elegans*, *Dreissena polymorpha*, many others from different localities, also minerals and Silurian fossils. Good exchange in shells. Send lists to—H. D., 4 Boulton Road, West Bromwich.

Wanted, fertile and vegetative spikes of all the species of equisetum, also botanic micro. slides, in exchange for photo-micrographs, mounted sections, volvox, etc.—T. B., Conservative Club, Hinckley.

Would be pleased to correspond with microscopists interested in freshwater algæ, with a view to exchange and mutual help.—J. Collins, 147 Muntz Street, Birmingham.

Would some collector kindly gather me twenty-four good specimens each of *Lactuca virosa* and *Cicuta virosa* for drying? Will give good British or foreign species in exchange.—A. E. Lomax, 56 Vauxhall Road, Liverpool.

Offered, sets and eggs of peregrine, chough, s. hawk, dipper, stonechat, goldcrest, coal-tit, long-tailed tit, creeper, rock pipit, corn bunting, reed bunting, twite, hooded crow, magpie, nightjar, rock dove, pheasant, ringed plover, oyster-catcher, c. sandpiper, snipe, landrail, mute swan, tufted duck, red-breasted merganser, little grebe, gannet, cormorant, shag, black guillemot, ringed guillemot, razorbill (white), puffin, swift tern, noddy, herring gull, kittiwake, Manx shearwater, storm petrel, and nests with small eggs. Wanted, complete clutches, equally good; small exchanges declined.—R. J. Ussher, Cappagh, Lismore, Ireland.

Simplex typewriter, nearly new, cost 10*s*. 6*d*.; will exchange for a few good slides, geological or entomological preferred.—F. G. Bing, 16 Lower Coombe Street, Croydon.

Wanted, good secondhand microscope. Offered, shells, minerals, fossils, microscopic objects and material, Haldon Greensand fossils, or state wants in exchange.—T. E. Sclater, Natural History Stores, 43 Northumberland Place, Teignmouth.

Duplicates of *Paludina contecta*, *Bythinia Leachii Lymnea glutinosa*, *Planorbis nautileus*, and numerous others, in exchange for shells not in collection, especially varieties of the helices. Lists to Tom Brown, 237 Beverley Road, Hull.

Duplicates.—Side-blown eggs (with data) of noddy and sooty terns, mute swan, Manx shearwater, tits, buntings, moorhen, scopolis sooty tern, and others. Wanted, clutches of many sorts, with data.—F. W. Paple, 62 Waterloo Street, Bolton.

Exotic Butterflies: many fine and rare species in duplicate; lists exchanged. Also wings of *Morphos Menelaus*, *Amathonte*, *Ega*, *Urania fulgens*, *Papilio Paris*, etc., for the microscope.—J. C. Hudson, Railway terrace, Cross Lane, near Manchester.

Drosera rotundifolia, offered six healthy plants in exchange for two well-mounted micro slides, diatoms preferred, or offers.—G. Barker, 24 Avenue Villas, Cricklewood, N.W.

Foraminiferous material wanted in exchange for slides of named species, dredgings or miscellaneous slides; can furnish duplicates of over fifty named varieties, some of them rare.—F. S. Morton, 158 Cumberland Street, Portland, Maine, U.S.A.

What offers for pathological and physiological animal tissue, including sections from human embryo, also twelve dozen slides, and a photomicrographic camera, amateur make, but efficient. Wanted, high-power objective and micro. accessories.—F. T., 82 High Street, Gosport, Hants.

Offered, Science-Gossip for 1887 and to September 1888, and Power's "Physiology" second edition in good order. Wanted micro. dissecting scissors, scalpel, etc., would also like to correspond with any beginner in microscopical work.—D. E. Seale, Harmoney Hall Road, Barbados.

"Magazine of Natural History," thirteen vols. half calf, conducted by Loudon and Charlesworth. Hooker's "Student's Flora Naturalist" vol. v. in exchange for other books or offers.—Rev. W. W. Flemyng, Clonegam Rectory, Portlaw, co. Waterford.

Unio margaritifer in exchange for plants, lepidoptera, or offers.—Rev. W. W. Flemyng, Clonegam Rectory, Portlaw, co. Waterford.

Offered, specimens of Auriferous quartz, and other minerals. Wanted foreign shells not in collection.—W. J. Jones, junior, 27 Mayton Street, Holloway, London, N.

BOOKS, ETC., RECEIVED FOR NOTICE.

"Marine shells of South Africa," by G. B. Sowerby F.L.S. F.Z.S. (London: Sowerby)—"Proceedings of the Newport Natural History Society" (Newport, printed for the Society by the Daily News job print)—"The Entomologist's Record" (London: Elliot Stock)—"The Celestial Symphony," by Augustus R. Schutz (Worthing: G. D. S. Kirshaw)—"The Portland Catalogue of Marine Plants," (Portland Society of Natural History, Portland, Maine, U.S.A.)—"Technics."—"Journal of Conchology," No. 2, Vol. vii. (Leeds: Taylor Brothers, Sovereign Street.)—"The International Journal of Microscopy and Natural Science," Vol. ii. (London: Bailliere, Tindall & Cox.)—"Journal and Proceedings of the Royal Society of New South Wales," (Sydney: published by the Society, 5, Elizabeth Street, North; London: Kegan Paul, Trench, Trübner & Co. Limited.)—"Proposal for a National Photographic Record and Survey," by W. Jerome Harrison, F.G.S. (London: Harrison and Sons.)—"The Botanical Gazette" (Bloomington, Indiana.)—"Natural Science" (London and New York: Macmillan & Co.)—"The Gentleman's Magazine," (Chatto & Windus.)—"The Entomologist," (London: West, Newman & Co.)—"Transactions of the County of Middlesex Natural History and Science Society," "The Annals and Magazine of Natural History" (London: Taylor & Francis), etc., etc.

Communications received up to the 12th ult. from: E. A. M.—Major-General J. R. O.—R. W.—A. R. S.—J. B. W.—W. H. B.—G. W. R.—C. H. J.—T. L.—N. E. A.—T. V. H—G. B.—M. C.—H. B.—J. S. W.—S. L. M.—A. E. L.—H. E. G.—H. St. A.—E. P.—J. C.—A. E. B.—F. H. P. C.—A. E. L.—T. B.—R. J. W.—T. E. S.—F. G. B.—F. J. G.—T. B.—H. D.—C. R. F.—Dr. L. E. K.—T. W. P.—E. W. W. B.—etc., etc.

A BOTANICAL EXCURSION IN SWITZERLAND.

HAVING read lately in a back number (July, 1888) of your paper, an article on a "Botanical Excursion in Switzerland," extending from Bex to Martigny and up the Rhone valley, I thought it would interest some of your readers to hear about the flora in the Zermatt valley, one of the spur valleys of the Rhone. In the article referred to above, the writer says he "looked longingly up the valley leading right and left to Zermatt and Saas," but was obliged to retrace his steps.

Our botanical excursion was taken in August, and the route selected from Thun was the one over the Gemmi pass to Visp, then up the Zermatt valley to a resting-place on the Riffel Alp.

I think hardly any route in Switzerland better illustrates the marvellous variety of the flora, as it includes such great variations of altitude and temperature—the almost sub-tropical heat of the Rhone valley contrasting with the cold of the Gemmi and Riffel Alp, both 8000 feet high. Consequently we had such a good opportunity of noticing the various zones of vegetation.

In ascending the Gemmi pass from Kandersteg these are strikingly illustrated. All round the little hotel at Kandersteg are rich meadows of luscious grass; here we found quantities of *Chrysanthemum montanum*, many varieties of Campanula, Scabiosa, Clastria, and the beautiful mauve *Colchicum alpinum*, besides a specimen of *Lilium martagon*. When a little way up the steep zigzag, among the pines, we came upon *Arnica montana*, its brilliant yellow flowers contrasting well with the blue of the *Aconitum napellus*, Helianthemum, *Dianthus sylvestris*. Then, after toiling up a little higher, our old friends the Gentians began to appear, along with the alpine Rhododendron or Alpenrose, this latter looking a little bit faded in the hot August sunshine. In this Gentian zone the Violas also abounded, the delicate scented yellow with the more showy-looking purple; also *Cytisus alpinus*. By this time we were getting beyond the pine-trees, the air felt distinctly cooler and more bracing, we were coming to the bare and rocky part of the pass, and also to a complete change in the character of the flora. We had lost the luxuriant vegetation of the valley: there were absolutely no trees, and we were beginning to fear our walk would lack interest from a botanical point of view, when, looking upon the masses of rock, we found we had reached the region of the glacier flowers, for in every crevice, growing with the scantiest amount of earth, in among the rocks were the tiny little flowers that constitute the chief charm of Swiss botany. There were masses of the pink Androsace and various sorts of Sedum. Here also we gathered *Dryas octopetala*, *Linaria alpina*, *Artemisia glacialis*, *Erinus alpinus*, and *Aster alpinus*. Besides these, the lovely blue of the tiny star-gentian and the pale blue of the myosotis gave a wealth of colouring that needs to be seen in order to be understood.

This last zone of flowers we found on the summit of the Gemmi (8000) growing in more or less profusion, but we had to wait till we reached Zermatt before we found the special flower of the mountaineer, viz., the Edelweiss, or *Gnaphalium leontopodium*. After crossing the Gemmi pass we hastened on to Zermatt, determining to make that our headquarters, having heard so much in praise of the botany there. We stayed at the Riffel Alp hotel, on the Riffel, at a height of nearly 8000 feet, commanding magnificent views of the Matterhorn, Zermatt valley, and Bernese Oberland. This makes a capital standing-

point for all sorts of excursions. Going down into Zermatt, to the gorges of the Gorner, or up the Smutt valley, we found a wealth of flowers. All those already mentioned as having been found on the lower slopes of the Gemmi, and, in addition, fine specimens of Gaudin's gentian found by the Gorner gorge, *Trifolium alpinum*, Sisymbrium, various kinds of Saxifrage, *Parnassia palustris*, Epilobium, *Pinguicula alpina*, etc. If one wishes more particularly the glacier flowers, it is possible in an easy excursion from the Riffel to obtain any quantities of Edelweiss and all kindred flowers of the high alps. The best place is on the farther side of the Findelen glacier. We found this a most delightful excursion. The Findelen glacier can be reached in from one to two hours from the Riffel hotel. It is necessary to cross the glacier in order to reach the desired spot, but this can be easily accomplished if one is only provided with nailed boots. Arrived on the other side, only a little climbing is necessary before reaching a perfect field of Edelweiss, covering the mountain side, with its white velvety flowers, making a fine contrast to the yellow Helianthemum and Arnica and the various shades of purple of the *Aster alpinus* and the pink of the Dianthus. Androsace and Sedum are covering all the rocks, while the blue of the Gentians and Myosotis complete the picture. We completed this excursion by returning by another route skirting the side of the glacier, down by rich alpine pastures full of all sorts of meadow flowers, then crossing a rustic bridge back through the pine woods to the Riffel.

In conclusion, I would just say that to preserve our specimens we simply used one of the ordinary flower-presses to be had in every Swiss town, consisting of two flat pieces of wood with thick folds of blotting-paper between, and a strap to fasten the whole firmly together. This we always took with us, so were able to press the flowers as soon as gathered, and we found that, with very few exceptions, they have retained their beauty and colour.

THE EARTHWORMS OF MIDDLESEX.

By the Rev. Hilderic Friend, F.L.S., Author of "Flowers and Flower-Lore," etc.

The county which contains the greatest city in the world, and has become famous in a great variety of ways, has hitherto been almost totally ignored by the student, whose special work it is to enlighten the world respecting those lowly, but invaluable creatures, whose ways Darwin has made familiar to us. The terrestrial annelids of Middlesex have never yet been tabulated, though many years ago one Dr. J. E. Gray made record of three species which he had found in the neighbourhood of Hammersmith. My own researches during a recent visit to the metropolis enabled me to study several examples which were full of interest, and by the courtesy of my correspondents I have yet more recently been able considerably to enlarge the list. Though I do not think the present report by any means does justice to the worm-fauna of Middlesex, I give it as the fullest contribution which could be made with our present knowledge, and in the hope that it may stimulate collectors in various parts of the country to send me further series of specimens for examination, in order that the important question of distribution may be better decided.

When I was at Hornsey recently, a friend with whom I was staying promised to show me an excellent series of worms, among which the common earthworm (*Lumbricus terrestris*, L.) was to be specially noticeable. "What will you say (I asked), if the earthworm proves to be conspicuous by its absence?" The idea was ridiculous, yet curiously enough, though no fewer than seven well-marked species were submitted to me, not a solitary example of the true earthworm was to be found amongst them! "I thought the earthworm was ubiquitous," exclaimed by friend. So thought everybody else, but then a more careful study of the science has shown us that it is wrong to jump at conclusions. "But is the common earthworm unknown in Middlesex?" it will be asked. Fortunately I have been able to obtain two specimens from that county, one in Regent's Park, and one from near Pinner, sent me by Miss Edwards, of Haydon Hall, Eastcote. It is true that Dr. Gray records it for Hammersmith, but then we have not the slightest evidence that it was the genuine creature; on the contrary there are indications that it was another species of worm to be named by-and-by, a worm which abounds in Middlesex, and has constantly been mistaken by amateurs, not to say more pretentious individuals, for the common earthworm. Now the true typical earthworm, as understood in the light of recent research, has a well-marked girdle about the first quarter of the body, which begins on the 32nd and ends on the 37th ring. This girdle is an indication that the worm is reaching years of discretion, or is of a marriageable age, and must not be supposed to result from the joining together of two portions when they have been severed by the gardener's spade.

Next to the earthworm in point of size comes the ruddy worm (*L. rubescens*, Friend), if we confine our attention for the nonce to this genus. It was quite unknown to science till last year,* when I found it in Yorkshire. It was next found among the Hornsey gathering already referred to, one solitary specimen being observed. A further solitary specimen I found at the same time on the Common at Tunbridge Wells, while another has reached me from Avon-

* Since the above was sent to press, Dr. Rosa of Turin has called my attention to the fact that this worm corresponds with a worm partially described years ago as *L. festivus*, Dugès. For a full account see "Nature," June 16th, 1892.

mouth in Gloucestershire. In Sussex and Yorkshire it occurs plentifully, though locally, so that its distribution is wide, though at present it appears to be unknown to any other helminthologist either at home or abroad. The girdle covers segments 34–39. In this respect the worm is incapable of being confused with any other species, as in every other British worm the girdle begins on some segment anterior to the 34th.

Thus in the red worm (*L. rubellus*, Hoffmeister), which is plentiful in this county, the girdle begins on segment 27. In every case the British members of this genus have six segments or rings included in the girdle, on the four innermost of which we find a band or swelling which bears the name of *tubercula pubertatis*, or the puberty band, as I prefer to call it in plain English. I have the red worm from Hornsey and Pinner, and Dr. Gray may perhaps have intended this species when he included the lesser worm (*L. minor*) in his list of species found at Hammersmith.

One other worm belonging to this genus is found in England, and it too occurs in Middlesex, which county therefore has the honour of being one of the five which alone have yielded all four indigenous species of Lumbricus up till the present time. This is the purple worm (*L. purpureus*, Eisen). It is much smaller than either of the foregoing, usually measuring two inches in length. The girdle extends from the 28th to the 33rd segment. Thus far I have only obtained it at Hornsey, but it is probably generally distributed throughout the district.

Before I proceed to enumerate the members of the next genus it may be well to define and tabulate the foregoing. The genus Lumbricus differs from the next (*Allolobophora*), in several essential particulars. The colour of the Lumbrici is always red-brown, with an iridescent colour-play when the light falls on the skin. The lip cuts the first ring completely in two. There are always six segments in the girdle, over four of which the puberty band is stretched. The bristles or setæ are always in couples, and the individual setæ in each pair are always close together. This prepares us for

A TABULAR VIEW OF THE GENUS LUMBRICUS.

Lumbricus.	Segments occupied by the				Average Length.	No. of Segments.
	Girdle.	Tubercula.	First Dorsal Pore.	Papillæ.		
1. Terrestris	32–37	33–36	$\frac{8}{9}$	15, 26 (or 25)	5 ins.	150–200
2. Rubescens	34–39	35–38	$\frac{5}{6}$	15, 28	4 ins.	130–150
3. Rubellus.	27–32	28–31	$\frac{7}{8}$	None	3 ins.	120–140
4. Purpureus	28–33	29–32	$\frac{6}{7}$	10 (or 11)	2 ins.	90–120

The next genus is larger and more vague. In some of the species nearly all the characters of the foregoing genus appear, colour, arrangement of setæ, position of pores and papillæ, and the like, while in others the differences are patent to the most casual observer. It is here we have to place, in the forefront, the long worm (*Allolobophora longa*, Ude), which is everywhere confused with the true earthworm, and erroneously recorded as such. At Hornsey it is abundant. Not less so is it in Regent's Park and other similar pleasure-grounds in London and the suburbs, and this is undoubtedly the species referred to by Darwin ("Vegetable Mould," p. 14), as occurring so frequently on the walks in Hyde Park after heavy rain. Mr. Beddard informs me that he has usually employed this species as the type in his biological lectures.

I place here, somewhat doubtfully another species (*Allo. complanata*, Dugès). I do this on the strength of a paper which was read this year by a London biologist, though I have not been able thus far to obtain an example of the worm for identification. As a nearly allied species has reached me, however, from the Essex side of London, as well as from Hertfordshire and Epping Forest, I have every reason to believe that further research will justify the inclusion of this species in the list of Middlesex worms.

Of the presence of the Brandling (*Allo. fœtida*, Savigny) there is no opportunity for doubt. Dr. Gray found it at Hammersmith, Mr. Chaloner dug me up specimens in his garden at Hornsey, where, however, they were rather cultivated than indigenous, while a capital series has been sent me from Eastcote by Miss Edwards. This worm, once seen, will never be mistaken for any other. Its bands of russet and gold, its yellow fluid and fœtid smell, all combine to render it the most conspicuous of all our native worms.

Nearly related to it, and almost equally favoured by the angler, is the gilt-tail (*Allo. subrubicunda*, Eisen). It loves a rich diet, greatly preferring the rich ooze of the river or the vegetable mould formed by decaying leaves or garden refuse. It is found near Pinner and at Hornsey, and will reward a little patient search in many other parts of the country. It is usually a rose-red or light ruddy-brown, with pale flesh under-surface, and the bristles in wide pairs, almost amounting to eight separate rows. Though I have not seen the green worm (*Allo. chlorotica*, Savigny), I have evidence of its occurrence in Middlesex, and with it I must place the turgid worm (*Allo. turgida*, Eisen), with which the list closes. This makes ten species in all, whereas at least a score occur in this country, and careful search would be sure to bring the county list up to something like eighteen species, if not higher. The six species of Allolobophora enumerated fall into three groups, or couples, the first and second, third and fourth, fifth and sixth, being respectively nearly related to each other. The subjoined table will best

illustrate the points of difference and similarity between them, and will enable the student to identify such as he may discover in future.

KNOWN MIDDLESEX ALLOLOBOPHORAS.

Species.	Segments occupied by			Setæ arranged in
	Girdle.	Tuber-cula.	First Dorsal Pore.	
1. Longa	28–35	32, 33, 34	$\frac{12}{13}$	Close Pairs.
2. Complanata . .	28–37	28–37	$\frac{12}{13}$	Unequal Pairs.
3. Fœtida . . .	26–31	28, 29, 30	$\frac{4}{5}$	Wide Pairs.
4. Subrubicunda .	26–32	28, 29, 30	$\frac{5}{6}$	Eight Rows.
5. Chlorotica . .	29–37	31, 33, 35	$\frac{4}{5}$	Close Pairs.
6. Turgida . . .	28–34	31, 33	$\frac{9}{10}$	Close Pairs.

GENERAL CHARACTERS.

1. Large, dark sienna brown. Generally mistaken for *L. terrestris.*
2. Needs further study as a native species.
3. Body divided into bands of gold and brown. Smells very fœtid.
4. Rose-red or light brown; not so large as the last.
5. Dirty green, sluggish; often curled up like a grub.
6. Grey or pink, with dull orange girdle near the head.

This genus is much more variable than the first. The lip never cuts through the first ring entirely, and the setæ are often wide apart, while the colour ranges from brown to rose-red, flesh, grey, green and other shades.

N.B.—In collecting worms it is important to select such as have a girdle or swollen knob for identifying the species. I shall be glad to examine and report on worms sent me from any locality at home or abroad. They must be placed in tin boxes lightly filled with soft moss, all injured specimens being rejected, and addressed—The Grove, Idle, Bradford.

OBSERVATIONS ON THE HABITS OF A MASON WASP.

A SMALL wasp (*Odynerus murareus*) hovered humming softly over a half-curled leaf of a rose-bush. The wings vibrated so quickly they seemed to involve the insect in a hazy vapour. Small caterpillars were feeding on the leaves of the bush, and some of the leaves were coiled by the caterpillars into a tubular dwelling with a web, preparatory to the caterpillars' assuming the pupa state. One of the fine threads glistened in the sunbeam, and following the wave of light its motion gave, as it swayed backwards and forwards to the ground I noticed a small green caterpillar half suspended, half touching the earth. The length of its silken rope exhausted for a time the secretion that made it, and prevented it reaching the earth, where the caterpillar intended protecting itself in some tiny fissure or crevice until it could feel the danger that menaced it in its leafy dwelling on the rose-bush had gone, and then to climb back there in safety.

But the wasp had followed the caterpillar from the curled leaf, apparently conscious that the thread was limited, then darting, clung to the caterpillar, swinging there. The additional weight of the wasp broke the thread, and the wasp and caterpillar went to the ground. The abdomen of the wasp curved on to the caterpillar writhing in its secure grasp, this action of the abdomen was evidently to sting the caterpillar, for the latter soon lost all power and became relaxed. The jaws of the wasp held it firm, and the antennæ hung over it. The little wasp then poised itself on its wings, as if to ascertain the weight or balancing of its helpless load, before flying away with it. It then rose, humming its way to the drapery folds on a statue of Flora, where it had constructed its first cell. It is curious that this same statue, and almost the same part of it, has for several years been selected by one of these wasps to build its nest on. It is not reasonable to suppose it to be the same insect that returns year after year to the same spot. It implies that the place is selected so often because of its adaptability to the requirements of this species of mason wasp. May not this apply also to

Fig. 117.—*Odynerus murareus.* Natural size.

many migratory birds, as the swallow tribe, that are said to return to the same spot to build and rear their young? Not because the same spot is utilized by the same species year after year, is it necessarily the same individuals that return to it, but that it happens to be selected by others of the same species because of the special advantages existing there, inducing the birds to select it so repeatedly.

The wasp, after alighting upon the edge of its cell, looked in, and as if its position was not convenient for depositing the caterpillar, the industrious creature moved a little further round its cell, then going in once more, coiled the caterpillar among the others round the single egg there. This caterpillar was the last to be deposited in that cell, and the wasp, apparently satisfied with the work, and knowing it had stored the requisite amount of food for the voracious grub about to turn from the egg, rested a little time on the edge of the cell, pluming its antennæ with its fore-legs and feet, and moving its head from time to time from side to side on its pivot-like neck, as though viewing and considering the surroundings. When it was ready it soared away, quite indifferent to the bees at clover-flowers on the lawn, and the starlings whistling in the ash-trees.

All these were nothing to the little wasp so intent on its own labours in the warm bright sunshine, and so satisfied with the selection of the spot and the security provided for its immature young. To a small body of water at some little distance it betakes itself, and after imbibing some with a drawing-in and extension of the abdomen, as though it required effort, it seeks some fine dry earth on the border among the flowers, which it moistens with the fluid it has imbibed, and with its strong jaws works into a kind of cement of until evening, when it returned and utilized the cell for a demesne during the night, resting with its head upwards. The next morning another egg is laid, and more caterpillars (the number varying from six to nine) are brought and deposited as in the first cell. The caterpillars are always stung, sufficiently, not to kill, but to send into a state of coma, when they lose all power of voluntary motion, without pain or sense to feel injury.

Nature in the instance of this wasp seems to exercise

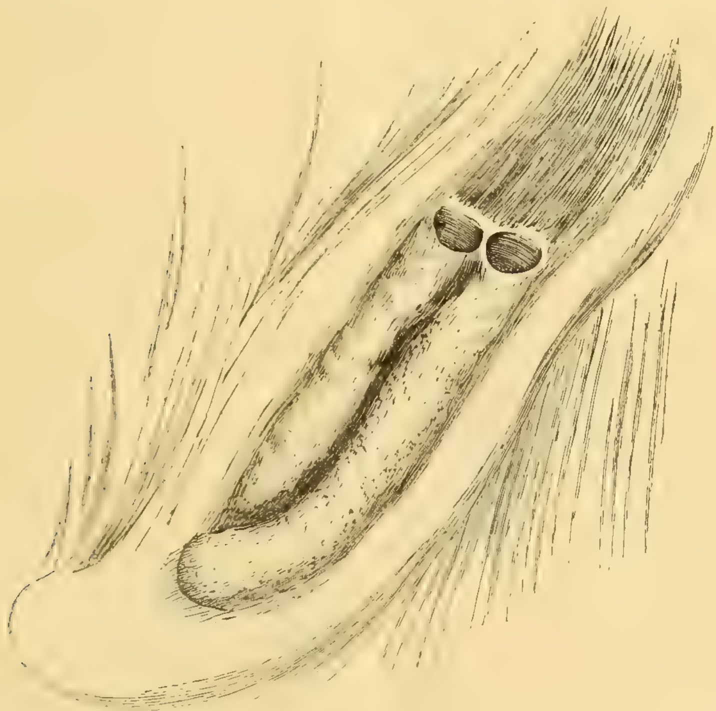


Fig. 118.—Clay nest of *Odynerus murareus* in the hollow formed by the drapery folds of a statue (magnified).

Fig. 119.—*a*, section of a cell from nest showing egg when first laid; *b*, section of a cell showing caterpillars arranged round the egg.

Fig. 120.—Larva of *Odynerus murareus.*

Fig. 121.—Pupa of *Odynerus murareus.*

the same quality as the cell is made of. It makes incessant journeys now to the water, and then to the earth, and back again to its cell, which it gradually closes over, sealing the caterpillars and egg quite close. By degrees this cover is moulded into a hollow, forming the base of a succeeding cell, and the sides are slowly raised by many small particles until another cell is constructed, ready for an egg and caterpillars for the wasp's young, in continuation of the one last completed. The wasp always finished a cell about midday, and was not to be seen again a kindlier means of utilizing one life for the food of another, than she does in many instances, as in the case of the butcher-bird impaling insects on the thorns in the wayside hedge, where they slowly die a painful death. After constructing nine to ten cells, the wasp leaves for ever the young it will never know, in the habitation that has cost it so much labour. The July sun, and the summer rain, pour on to this clay home of the wasp, and at night the dew, with a silent footfall, covers it with beads of moisture, yet the growing life within this simple

habitation receives no injury from the alternate heat and wet.

In about fourteen days the egg turns into the larva, that at once commences to devour the comatose caterpillars. By the time these are eaten the grub has become matured, and it passes excrement for the first time, then spinning a close web round itself, inside the cell, with the excrement left between the web and the cell-wall, so that the former does not come in contact to corrupt the living larva of the wasp. The latter now gradually changes to the pupa state, the body moulding into three divisions, the wings and the other appendages becoming apparent, and growth goes on until the matured insect works its way from darkness through its earthen casement, into the bright light of day. The mind of the insect perfected, ready for immediate action, at once performs the functions of which its development is capable, the judgment of distance, of form, colour, and scent. These and other exciting agents act on the creature's mind formed for instant function, and it wings its way from the place of its birth through sunbeam and shadow, a pleased and a perfect life.

HENRY W. KING.

Muswell Hill.

SPECIES, VARIETIES, ETC., DESCRIBED OR OBSERVED IN GREAT BRITAIN AND IRELAND SINCE THE PUBLICATION OF BABINGTON'S MANUAL, ED. 8 (1881), AND HOOKER'S STUDENT'S FLORA, ED. 3 (1884).

By ARTHUR BENNETT, F.L.S.

LONDON CATALOGUE, ED. 8.

No. 1.

Thalictrum majus, Crantz, var. *capillare*, N. E. Brown, Eng. Botany, ed. 3, Supp. p. 4, 1892.

Caltha palustris, L., var. *procumbens*, Beck in Huth's Monog. Gatt. Caltha, 1891. Surrey. Creeping; leaves small as in *minor*. Reported as *minor*.

Caltha palustris, L., var. *zetlandica*, Beeby in Scot. Nat., 1888, p. 210, 1887, p. 21. Creeping and rooting; closely allied to *C. radicans*, Forst., to which Mr. Beeby is inclined now (1888) to refer it.

Ranunculus flammula, L., var. *petiolaris*, Lange, ex Marshall, Journal of Botany, 1889, p. 230. Argyle! Isle of Skye! A marked variety, the leaves somewhat like *littorella*, stems zigzag, leaves linear.

Ranunculus flammula, L., var. *ovatus*, DC. Druce in Journal of Botany, 1890, p. 227, and var. *latifolius*, Wall, Druce, l.c. Oxford. States rather than varieties, the latter the normal form according to Walroth.

Ranunculus acris, L., var. *multifidus*, DC. Druce, Journal of Botany, 1890, p. 227. Oxford.

Ranunculus acris, L., var. *pumilus*, Wahlenberg, Fl. Lapp, pp. 159, 160, 1812. North side of Cairngorm, at 2800–3500 ft. Druce, Journal of Botany, p. 204, 1889. Leaves nearly smooth, glossy; usually 1-flowered; habit different to type.

Ranunculus aquatilis, var. *cambricus*, A. Bennett. Growth and habit of *R. fluitans*, but leaves much shorter segments, peduncle shorter, flowers very small, rarely fertile; allied to *Batraclium hirsutissimum*, Prahl, Kritische Flora, Sch. Holstein, 1890, p. 4, and *R. phellandifolius*, Flora Danica, t. 2357. Wales. J. E. Griffith.

Cakile maritima, Scop., var. *sinuatifolia*, DC. In the north. Leaves sinuate-dentate.

Nasturtium amphibium, R. Br., var. *variæfolium*, DC., and var. *indivisum*, DC. Druce, Journal of Botany, 1890, p. 228. Oxford. Names explain differences.

Nasturtium palustre, DC., var. *pinnatifidum*, Tausch., B. White in Scot. Nat., 1885-86, p. 320. Perth. Leaves deeply pinnatified.

Nasturtium officinale, R. Br., var. *microphyllum*, Reich. S. Hants. Linton Ex. Club Report, 1890, p. 283. Leaflets smaller, terminal large, wedge-shaped.

Arabis alpina, L. Isle of Skye! H. C. Hart in Journal of Botany, 1887, p. 247. A. Bennett, Scot. Nat., 1887-88, p. 180. Eng. Botany, 3 ed. Supp. t. 117*a*. p. 24, 1892. Nearest in habit to *A. hirsuta*. Occurred very rarely on the Cuchullin Mts. Differs, leaves more coarsely toothed, more stem clasping, flowers larger, sepals bulged at base, etc.

Cardamine amara, L., var. *lilacina*, F. B. White in Scot. Nat., 1890, p. 299. Flower lilac. Perth.

Cardamine flexuosa, with *umbrosa*, G. et G. (under *sylvatica*, Link), p. 109, 1848. F. B. White, Scot. Nat., 1885–86, p. 230. Perth.

Cochlearia grœnlandica, L., Sp. Pl. ed. 1, p. 647, 1753. Shetland. Beeby, Scot. Nat. 1887–88, p. 22. Marshall, Journal of Botany, 1889, p. 231; 1890, p. 180, "Ben Lawers." Dwarf, compact, pouches larger than in *alpina*, etc.

Sisymbrium officinale, Scop., var. *leiocarpum*, DC. Perth! F. B. White, Scot. Nat., 1885-86, p. 321. Pods nearly or quite without hairs.

Viola canina, L., var. *lucorum*, Reich. Beeby, Journal of Botany, 1889, p. 227. "Cambridgeshire, A. Fryer." Var. *crassifolia*, Grönvall. Beeby, l.c. Cambridgeshire, A. Fryer. Stouter, leaves thick, etc.

Viola riviniana, Reich., var. *villosa*, N. W. and M., var. *nemorosa*, N. W. and M. Surrey. Beeby, l.c. Large-flowered; narrow petals, corolla spur colored.

Viola hirta, L., var. *glabrata*, Beeby, Journal of Botany, p. 68, 1892. *V. scraphita*, Bab., not of Reich. Pod glabrous.

Viola tricolor, L., var. *confinis*, Lloyd. Fl. de l'Ouest, p. 43. N. Stafford. W. H. Purchas, Ex. Club Report, 1885, p. 124. Much like *V. lutea*, but no underground stem.

Polygala oxyptera, Reichb. var. *collina*, Reich, Ic. Crit., t. 23, f. 46. Coast of Ross-shire. Marshall, Journal of Botany, 1891, p. 216. Smaller, more compact, etc.

Silene acaulis, Jacq., var. *elongata*, Gaud. Druce in Journal of Botany, 1890, p. 41. Inverness.

Cerastium semidecandium, L., var. *glandulosum*, Reich. Druce, Journal of Botany, 1890, p. 228. Oxford.

Cerastium articum, Lange, 1880. A. Bennett, Scot. Nat., 1885–6, p. 331. This plant, separated from *alpinum* and *latifolium* by Lange, has been found in several counties. Sir J. D. Hooker refers it to *alpinum*. N. C. Brown, in Supp., 3 ed., Eng. Bot., p. 42, to *latifolium*.

Cerastium longirostre, Wicheru. Shetland. Beeby, Scot. Nat., 1887–88. Very large form of *triviale* with long leaves, etc.

Arenaria Lloydii, Jord. Marshall, Journal of Botany, p. 83, 1887. A form of *serpyllifolia*, L., stouter, more compact, and with thicker sepals, etc.

Arenaria gothica, Fries, Mant., 2, pp. 33, 34, 1839. Whitwell, Journal of Botany, 1889, pp. 314, 354. A. Bennett, Trans. Bot. Soc. Edin. 1890, p. 252. C. Bailey, Mem. Manchest. Lit. and Phil. Soc., 1890. Yorkshire. A plant closely allied to *A. norvegica* and *A. multicaules*, habit of *A. serpyllifolia*, but flowers very large and star-like.

Arenaria Boydii, Buch. White in Trans. Bot. Soc. of Edin., vol. 17, p. 33 (1887). Aberdeen! A doubtful plant, flowers sparingly produced, requires to be again gathered.

Hypericum pulchrum, L., var. *procumbens*, Rostrup. Shetland. Beeby, Scot. Nat., 1887–88. Creeping, small sparsely-flowered form.

Geranium sylvaticum, L., var. *parviflorum*, Blytt. Druce, Journal of Botany, 1880, p. 41. Small-flowered form, referred to many years ago by Joseph Woods in the N. of England.

Geranium sanguineum, L., var. *micrantha*. B. White, Scot. Nat., p. 321, 1885–86. Smaller, more procumbent, leaves crowded, flowers small, peduncules (usually) 2-flowered, etc. Has not altered under cultivation in Scotland and Surrey.

Oxalis acetosella, L., var. *subpurpurescens*, DC. Eng. Bot., 3 ed. Supp., p. 56.

Medicago lupulina, L., var. *scabra*, Gray. Druce, Journal of Botany, 1890, p. 229. Oxford.

Trifolium arvense, L., var. *prostratum*, Lange (var. *maritimum*, Townsend, Flora, Hants). Hants, etc. Procumbent, heads globose, etc.

Trifolium dubium, Sibth., var. *pygmæum*, Soy. Will. B. White, Scot. Nat., 1885–86.

Trifolium procumbens, L., var. *major*, Reich. B. White, Scot. Nat., 1885–86.

Anthyllis vulneria, var. *ovata*, Bab. Beeby, Scot. Nat., 1888, p. 210. Shetland.

Anthyllis vulneria, var. *maritima*, Rich. Eng. Bot., 3 ed., Supp., 1892.

Vicia cracca, L., var. *incana*, Thuill. Messrs. Linton, Journal of Botany, 1890, p. 167.

Lathyrus pratensis, L., var. *villosus*, Schl. Druce, Journal of Botany, 1890, p. 41. Inverness.

Spiræa ulmaria, L., var. *denudata*, Presl. B. White, Scot. Nat., 1885–86. Several counties.

Potentilla anserina, L., var. *glabrata*, Sond, Druce, Journal of Botany, 1890, p. 229. Oxford.

Potentilla anserina, L., var. *serica*, Rich. B. White, Scot. Nat., 1885–86.

Potentilla maculata, Pour., var. *debilis*, Rich. B. White, Scot. Nat., 1885–86.

Potentilla reptans, L., var. *microphylla*, Tratt. Cambridgeshire. Journal of Botany, 1888, p. 79.

Potentilla reptans, Zimm. Surrey (Watson), Camb. (Fryer), etc. Beeby, Journal of Botany, 1888, p. 79. *P. Tormentilla* x *procumbens*?

Rosa mollis, Sm., var. *glabrata*, Fries. Ross, E. F. Linton, Scheutz, Journal of Botany, 1888, p. 67.

Rosa canina, L., var. *Lintoni*, Scheutz (*sub-corifolii*) Scheutz, l.c.

Rosa tomentosa, Sm., var. *uncinata*, F. A. Lees. Llanfairfechan, Wales. Report of Botanical Record Club, p. 117, 1884–86.

Rosa Ripartii Déséglise. Nicholson, Journal of Botany, 1886, p. 111. Surrey.

Rosa stylosa, var. *pseudo-rusticania*, Crep. Rev. M. Rogers, Journal Botany, 1889, p. 23. Wilts, Devon, Dorset.

Rubi. Some fifty additional names have been published, principally in the Journal of Botany and Exchange Club Reports: it hardly seems necessary to give the names, as they can only interest a few botanists, and they will know where to seek them.

Epilobium Lamyi, F. Schultz. Worcester. Towndrow, Journal of Botany, 1885, p. 349. Many counties since. Near *tetragonum*, but stolons, etc., different.

Epilobium collinum, Gmel. Perth. Druce, Scot. Nat., 1887–88, p. 330. Some thirty to forty hybrids have been published in the Journal of Botany since 1885, by the Rev. Marshall, only those specially interested in the genus will be likely to require their names.

Pimpinella major, Huds., var. *rubens*, Fleish, and "Sind," Lind meant, I suppose? Druce, Journal of Botany, 1890, p. 229. Oxford.

Æthusa cynapium, L., var. *agrestis*, Wall. Several counties—a very small, condensed form.

Galium verum, L., var. *littorale*, Breb. Norfolk. Arth. Bennett, Journal of Botany, 1881, p. 358.

Galium palustre, L., var. *microphyllum*, Lange. Beeby, Scot. Nat., 1887–88. Shetland.

Scabiosa arvensis, L., var. *pinnatifida*, Gray, var. *integrifolia*, Gray. Druce, Journal of Botany, 1890, p. 229. Oxford.

Hieracium. Over fifty names have been published, some supposed to be endemic forms. Mr. F. J.

Handbury is now publishing a beautifully illustrated monograph of the British Hieracia, and those botanists who wish to see our plants studied cannot do better than subscribe to it.

Carduus arvensis, var. *horridus*. Perth, etc. B. White, Scot. Nat., 1885–86. A very spiny state of the plant.

Carduus (*Cnicus*) *lanceolatus*, Willd., var. *nemoralis*, Reich. Ross. Druce, Journal of Botany, 1890, p. 42.

Crepis virens, var. *agrestis*, Pryor, Fl. Herts.

Anthemis cotula, L., var. *maritima*, Bromf. Townsend, Fl. Hants, p. 180. Isle of Wight. Leaves fleshy, stem procumbent.

Sonchus oleraceus, L., var. *triangularis*, Wallr. O. Hebrides. W. S. Duncan! Var. *lacerus*, Wallr. B. White, Scot. Nat., 1885–86.

Sonchus arvensis, L., var. *angustifolius*. Ex. Club Report, 1888, p. 124. Norfolk.

Achillea millefolium, L., var. *alpestris*, Rich. Beeby, Scot. Nat., 1887–88. Shetland.

Matricaria inodora, L., var. *phæcephala*, Rup. Beeby, Scot. Nat., 1887–88. Shetland.

Campanula rotundifolia, L., var. *hirta*, Rich, var. *velutina*, DC. B. White, Scot. Nat., 1885–86.

Vaccinium myrtellus, L., f. *microphylla*, Lange. Beeby, Scot. Nat., 1887. Shetland.

Vaccinium intermedium, Ruthe. Science Gossip, 1872, p. 248, fig. 174. Linnean Soc. Journal, 1888, p. 125.

Gentiana amarella, f. *multicaulis*, Lange. Ex. Club Report, 1886, p. 156. Caithness. Many stems, flowers pale.

Linaria repens, Mill., var. *grandiflora*, Godr. Druce, Journal of Botany, 1890, p. 230. Oxford.

Veronica anagallis, var. *anagalliformis*, Bor. W. F. Miller, Journal of Botany, 1890, p. 23. Caithness.

Euphrasia paludosa, Townsend. Journal of Botany, 1891, p. 161. Aberdeen.

Melampyrum pratense, L., v. *hians*. Druce, Scot. Nat., 1885–86, p. 76. Wigton, etc.

Rhinanthus crista-gallii, L., var. *angustifolia*, G. et G. Ireland. Druce, Journal of Botany, 1891, p. 306, var. *fallax*, Journal of Botany, 1891, p. 8.

Rhinanthus crista-gallii, var. *Drummond-Hayi*. B. White, Scot. Nat., 1885–86. Small, hairy, subalpine.

Pinguicula vulgaris, L., var. *alpicola*, Rechb. Druce. West Ross.

Pinguicula vulgaris, L., var. *bicolor*, Nordst. Corolla violet, labium white. Ben Nevis. Marshall, Journal of Botany, 1889, p. 233.

Mentha hirsuta, L., var. *pedunculata*, Pers. Druce, Journal of Botany, 1890, p. 231. Oxford.

Mentha Nicholsonia, Journal of Botany, 1889, p. 57.

Thymus serpyllum, Fr., var. *prostratum*, Horn. Shetland. Beeby, Scot. Nat., 1887–88, p. 27.

Marrubrium vulgare, L., var. *apulum*, DC. Druce, Journal of Botany, 1890, p. 230.

Stachys palustris, var. *canescens*, Lange. *S. segetum*, Hag. Journal of Botany, 1890, p. 43.

Plantago maritinum, L., f. *pumila*, Kjell. Sutherland. Journal of Botany, 1889, pp. 108, 377.

Plantago coronopus, var. *pygmæa*. Beeby, Scot. Nat., 1887–88, p. 27. Shetland.

Plantago maritinum, L., var. *prostrata*, Lange. Druce, Journal of Botany, 1889, p. 202.

Polygonum mite, Sch., var. *angustifolia*, Braun. Druce, Journal of Botany, 1890, p. 221. Oxford.

Polygonum viviparum, L., var. *alpina*, Wahl. Shetland. Beeby, Scot. Nat., 1890, p. 216. Arth. Bennett, Annals of Scot. Nat. History, 1892. O. Hebrides.

Rumex propinquus, Aresch. "*R. domesticus* x *crispus*." W. H. Beeby, Scot. Nat., 1890, p. 300. Shetland.

Callitriche polymorpha, Lönnroth. W. H. Beeby, Journal of Botany, 1888, p. 233. Shetland. Arth. Bennett, Journal of Botany, 1891, p. 85. Surrey.

Callitriche stagnalis, var. *serpyllifolia*, Lönn. Sutherlandshire. Marshall, Journal of Botany, 1890, p. 180. Smaller than type, leaves smaller, more rotund, fruit very abundantly produced, smaller than type.

Hippuris vulgaris, L., var. *fluviatilis*, "Roth, 1788," but Weber had so named it in 1780. Druce, Journal of Botany, 1890, p. 229. Oxford. Deep-water form, with flaccid leaves and stems.

Urtica dioica, var. *angustifolia*, A. Blytt. Exch. Club Report, 1888, p. 230. Narrow-leaved form, leaves drawn out at the end.

Var. *atrovirens*, G. et G.? Exch. Club Report, 1888, p. 230. Leaves oval, petioles long, stipules large, etc. Not certainly British.

Var. *microphylla*, Hausm. Leaves small, stem much branched, etc. Oxford. Druce, Exch. Club Report, 1888, p. 231.

Betula intermedia, Thomas. S. Aberdeen. E. S. Marshall, Journal of Botany, 1887, p. 167. Specimens have been referred here by good continental botanists, and they seem correct. Like a large *B. nana*, or small *B. glutinosa*.

Betula odorata, var. *parvifolia*, Wimm. Forfar, Inverness, Sutherland. Journal of Botany, 1890, pp. 43, 169. Small tree, or shrub; leaves small.

Salix. Close on forty names have been published. Dr. Buchanan White has published a "Revision of the British Willows" in the Journal of the Linnean Society, pp. 333–457, 1891, in which he recasts our nomenclature, adding many hybrids, etc. Details must be sought there.

Orchis latifolia-maculata. Townsend, Flora of Hants, p. 341. Journal of Botany, 1889, p. 244.

Orchis incarnata, var. *ochroleuca*, Wüstnei, Flora d. Umgegund von Schwerin, 1854. Clarke, Flora Andover. Hants.

Potamogeton fluitans, "Roth." Cambridge, A. Fryer. Surrey, W. H. Beeby, Ex. Club Report, 1884, p. 111. Like deep-water forms of *polygonicolius*, but spikes and fruit of *natans*.

Potamogeton crassifolius, A. Fryer. Journal of Botany, 1890, p. 321. "*P. Zizii* x *P. natans*." Cambridgeshire.

Potamogeton coriaceus (Fryer), Nolte as a var. A. Fryer, Journal of Botany, 1889, p. 8. Cambridgeshire. Like Zizii, but leaves mostly large at apex.

(*To be continued.*)

METEORIC DUST?

An old friend, Mr. Charles Blechynden, of Alipore, recently gave me a small packet of the black dust which gathers in the leeward corners of the terraces of our houses here; be it remembered that our houses are flat-roofed, and their terraces often extensive surfaces. Mr. Blechynden told me he found this dust contained "meteoric iron," and that by plunging a horse-shoe magnet into a handful of the crude dust, minute particles clung to the edges and poles of the magnet. I have since separated and mounted some. The method I have adopted is the following: with a camel's hair brush, I brush off the fine dust which adheres to the magnet poles. and collect a small quantity on a sheet of white post paper. Numerous brushings result in only a very small quantity. The material thus obtained from the magnet poles still includes some admixture of foreign matter—spores, vegetable fibres, particles of feathers, broken and dried filaments of the Algæ (probably an advanced stage of *Protococcus cohærens*?) which blacken our walls within a few months of their being white-washed, particles of sand and soot, etc. In order to get rid of at any rate a portion of these, I apply the magnet to the under surface of the paper, and working it backwards and forwards, I am enabled to draw out the iron particles by magnetic attraction and to bring them together, towards the edge of the paper, when I brush them off into a drop of xylol-balsam on a slide. A cover-glass has now to be added, and the balsam hardened by heat in the usual way. Microscopic examination shows that the mount, in addition to some sand particles and extraneous matters, includes a few minute spherical bodies, most of them black and opaque, but some clear and glass-like, and containing bubbles. The opaque spheres have shiny surfaces. and look so much like miniature aerolites that perhaps Mr. Blechynden is correct in calling them "meteoric dust." Are the transparent, bubble-bearing spheres meteoric (or volcanic) glass?

A few measurements may be appropriate; they are taken from eight spheres passed at random through the centre of the field: 2-1000"; slightly over 3-1000" (two); nearly 3-1000"; 1-200" (this is a hyaline sphere with a large bubble enclosed in it); nearly 1-400" (two); nearly 1-250". There are other masses, opaque and in other respects similar in appearance to the spheroidal bodies, and save as to form, they seem to be identical in structure with the opaque spheres, Their contours are rounded, but they are irregular in outline. I have taken some dust from a field, and there are iron particles in it, but their edges are angular and jagged, and they may only be fragments knocked off horse-shoes by flints, or other hard substances. Not being myself at all familiar with the appearance of meteoric dust, it is only with some hesitation that I have chosen the title for this note. I enclose a little of the "dust" simply brushed off the poles of my magnet; if it is put on a thin sheet of paper, and a magnet applied to the under surface of the paper, I venture to hope that some of the spheres of iron will be attracted out of the mass, and that on being mounted in balsam they will verify the facts above stated. Are the particles meteoric and is the method of obtaining them which I have adopted reliable?

W. J. Simmons.

Calcutta.

ON OUR FUTURE SUPPLIES OF ENERGY.

A GREAT question has, for a quarter of a century past, been haunting the minds of all thoughtful men like a ghost. The world is getting alarmed at the increasing price of coal, and the fact that the natural supply is more limited by every ton consumed. As civilization progresses, energy will be more required for its development, and the progress of science and civilization are so strongly bound up together that we cannot put them asunder. Three hundred and fifty years ago, in Queen Elizabeth's time, coal was hardly used at all, perhaps owing to the abundance of timber which prevailed. At that time the population of England did not greatly exceed the present population of London and its suburbs. Three centuries and a half represent a microscopically small space in the evolution of the human race. But within that period we have managed to get through nearly half of the natural stock of coal which Nature stored up in our British coal-cellars many millions of years ago. What will be the condition of those coal-cellars three centuries and a half hence at our increasing multiple-proportion ratio of consumption? Will there be any left? If there is, will it not be too expensive to use for common purposes? No doubt other coal-fields may be discovered in the interval, and, before the end of the above period, will have been actively worked, notably the as yet unexplored coal-fields of East Anglia.

Coal, however, merely represents the fossilised energy of a by-gone geological period. Nature is still charged with full abundant energy, more than we want,

as every cyclone, hurricane, thunderstorm, earthquake and volcanic eruption plainly indicates. The shores of the Mediterranean round about that giant volcano, Mount Etna, are at this very moment throbbing, riving and groaning, overflowing with natural energy. All natural energy can easily be translated by man into light, heat and motion. Coal could do no more, even if our planet were a solid mass of it. The history of the last fifteen years of physical scientific discovery, particularly in electricity, reads like a fairy tale. Who would have thought, fifteen years ago, that we should now be speaking to each other at distances a thousand miles apart, through wires not exceeding the thickness of a fiddle-string? that the phonograph core would be mailed to Australia and elsewhere, with the vocal blessings and last words of fathers and mothers in England—that our streets, houses and ocean-going ships would be lighted by electricity with the brilliancy of the noon-day sun, to say nothing of the dark places of the earth, such as coal and metal mines, which are healthier, by the same illuminative power?—that the tramcars of our streets would be locomotived by electricity instead of steam, and it would be possible in the year 1892 to purchase electrical energy, capable of being applied in half a score different ways, just as easily as to get the fossilised energy called coal at a coal merchant's stores?

The next three centuries and a half will witness a marvellous development of economic science. Coal, long before that, as a form of energy will be regarded as a somewhat antique, archæological and worked-out material. The ebbing and flowing tides, the shifting winds, the running waters to the ocean, will have taken its place. Perhaps by a period in the future no further distant than that which separates us from Queen Bess's glorious days, even the volcanic and earthquake energy of our planet will be enlisted in the service of mankind. Indeed, there is going on at the present time a line of enquiry and research which, even in the short space of the next five years, will possibly affect the commercial interests of the whole world. In the Caspian Sea, for some time past, in use on steamers and locomotives, petroleum has been employed. The change is simply a matter of mechanical adaption and manipulation. The coal-fields of the world will certainly be worked out within an historically brief space of time. Will the natural petroleum supplies last longer? Keen-eyed modern science is not blind to that question. The distinguished Russian chemist, Dr. Mendeleef, thinks there is good ground for believing that abundance of petroleum will always be available. Rock oil, we are reminded, belongs to no particular strata, though it is found generally in regions lying parallel to mountain ranges. In Europe, for example, it is tapped in rocks of the Tertiary period, but in the United States it rises out of Devonian and even Silurian formations. Dr. Mendeleef suggests that this valuable heat-giving substance is constantly being formed by the action of water on metallic deposits in the heated interior of the earth. The extraordinary average persistence of the oil-wells supports (as was observed by the President of the English Institution of Mechanical Engineers) the theory that it is probably forming as fast as it is removed.

J. E TAYLOR.

NOTES ON NEW BOOKS.

THE Physiology of the Invertebrata, by Dr. A. B. Griffiths (London: L. Reeve & Co.). Dr. Griffiths is one of the hardest workers we have, both in departments of original research, and with his pen. He has thrown a very wide-cast net over his subjects, from the diseases of crops to the Invertebrata. The present text-book displays wide and extensive reading and study. It is a branch of biology which hitherto has been comparatively little studied, perhaps for want of such a manual as Dr. Griffiths has now provided for students. From a literary point of view, it is a useful review of all the important researches on the subject, which have taken place within the last twenty years—perhaps the most fruitful epoch in biological discovery. We cordially recommend Dr. Griffiths' excellent and lucidly arranged manual to our readers.

In Starry Realms, by Sir Robert Ball (London: Isbister & Co.). The now Cambridge Professor of Astronomy has practically taken the place of the late Richard Proctor as an eloquent lecturer and writer on popular astronomy. All his books are eminently readable, and the present handsomely got-up one will not linger behind its predecessors in this respect. Most of its contents have already been before the public in various magazines. It contains twenty-three chapters, all the titles of which are attractive, and some of them sensational—as, for instance, those on How the Heat of the Sun is kept up; Fire-balls; a Falling Star; the Number of the Stars; &c. The illustrations are all excellent. Indeed, the volume is most luxuriously and tastefully got up.

Res Judicatæ, by Augustine Birrell (London: Elliot Stock). A new book by the author of "Obiter Dicta" is a literary event. We have read the essays and papers in this tastefully got up little volume with intense delight, and with the strong desire that any strong words of ours may induce the readers of SCIENCE GOSSIP to forthwith procure the book for themselves, so as to profit by the editor's experience. There are twelve essays, chiefly dealing with the *personal* aspects of literature; all written in delightful English, pleasant, sunny, humorous, pathetic. *Res Judicatæ* is a book to keep on one's study table, to take up when other books tire you.

Tanganyika; Eleven years in Central Africa, by Edward Coode Hore (London: Edward Stanford).

The author of this book was Master Mariner of the Central African Mission on the great lake. This book records his eleven years' experience. It was a risky one, and could only have happened to a brave and cool-headed man. It is a stirring account of an enthusiastic traveller, who loved his work, and thought no toil too great for the great cause to which he was devoted. Captain Hore is evidently a keen observer, as well as an energetic traveller, and his book contains numerous references to the Ethnology, Physical Geography, and Natural History of the districts he seems to know so well. The literary style of the volume is pleasant and graceful, and the illustrations are good.

Marine Shells of South Africa, by G. B. Sowerby, F.L.S., F.Z.S. Whatever Mr. Sowerby has to say concerning marine shells is bound to receive the attention of naturalists. The present useful volume is a catalogue of all the known species, with references to figures in various works, descriptions of new species, and figures of such as are new, little known, or hitherto unfigured. There are five plates of shells, comprising about ninety species, all of them drawn in that neat and graceful style, for which the name of Sowerby is famous.

The Study of Animal Life, by Arthur Thompson, M.A., F.R.S.E. This volume is one of the series issued with a view to aid the University Extension movement throughout Great Britain. It is intended by the author as a working manual for elementary zoological students. It contains twenty chapters, which range over a large field of biological speculation and research, and each chapter has appended to it a bibliography of the various books dealing with the subjects discussed. The illustrations are numerous and all of them good. The chapters are headed as follows:—Part I. The Everyday Life of Animals. Chapter I. The Wealth of Life. Chapter II. The Web of Life. Chapter III. The Struggle of Life. Chapter IV. Shifts for a Living. Chapter V. Social Life of Animals. Chapter VI. The Domestic Life of Animals. Chapter VII. The Industries of Animals. Part II. The Powers of Life. Chapter VIII. Vitality. Chapter IX. The Divided Labours of the Body. Chapter X. Instinct. Part III. Chapter XI. The Elements of Structure. Chapter XII. The Life-History of Animals. Chapter XIII. The Past History of Animals. Chapter XIV. The Simplest Animals. Chapter XV. Backboneless Animals. Chapter XVI. Backboned Animals. Part IV. The Evolution of Animal Life. Chapter XVII. The Evidences of Evolution. Chapter XVIII. The Evolution of Evolution Theories. Chapter XIX. The Influence of Habits and Surroundings. Chapter XX. Heredity. Appendix I. Animal Life, and Ours. Appendix II. Some of the Best Books on Animal Life. Mr. J. A. Thompson has done his work in a masterly manner, and we cordially recommend his works to students.

The Naturalist in La Plata, by W. H. Hudson (London: Chapman & Hall). The author of this delightful volume is an old and highly welcome correspondent of SCIENCE-GOSSIP, in whose past volumes several articles from his pen, on South American Natural History, have appeared. The fact that the present work has passed into a second edition within a few months from the issue of the first, shows how it has caught on. The land of the Pampas is one of the most individualised portions of the earth, and Mr. Hudson is its naturalist. He describes what he has seen with a literary vividness, which reminds one of poor Richard Jeffries. "The Naturalist in La Plata" will take its place in the rank of such books as Charles Darwin's "Voyage of the 'Beagle,'" Wallace's "Malayan Archipelago," Bates' "Naturalists on the Amazons," and Thomas Belt's "Naturalist in Nicaragua." We cordially recommend our readers to lose no time in procuring Mr. Hudson's book. It is well and clearly printed on good paper, and strongly bound, as it deserves to be. The illustrations, nearly thirty in number, are gems of their kind. The following are the titles of the twenty-four chapters, some of which, however, we must say are scarcely good enough to describe the rich originality of the author's literary style, and power of observation:—"The Desert Pampas;" "The Puma, or Lion of America;" "A Wave of Life;" "Some Curious Animal Weapons;" "Fear in Birds;" "Parental and Early Instincts;" "The Mephitic Skunk;" "Mimicry and Warning Colours in Grasshoppers;" "Dragon-Fly Storms;" "Mosquitoes and Parasite Problems;" "Humble Bees and other Matters;" "A Noble Wasp;" "Nature's Night-lights;" "Facts and Thoughts about Spiders;" "The Death-Fuging Instinct;" "Humming-Birds;" "The Crested Screamer;" "The Woodhewer Family;" "Music and Dancing in Nature;" "Biography of the Vizcacha;" "The Dying Huanaco;" "The Strange Instincts of Cattle;" "Horse and Man;" "Seen and Lost."

A Mendip Valley, by Theodore Compton (London: Edward Stanford). Many years ago a little volume was published by the present author under the title of "Winscombe Sketches." It reminded one of Miss Mitford's village, so keen and sympathetic were its sketches of country life. It is a singular fact, but universally true, that the best literary describers and word-painters of country life are naturalists. There is a great deal in the "Winscombe Sketches," which show that the author has sat at the feet of the Rev. Mr. White of Selbourne. The present work is practically an enlargement of its predecessor of another name. It is just one of those books, the reading of a chapter of which, by a jaded city man who has not quite lost his literary and scientific tastes, would act like an anodyne. There are upwards of fifty delightful illustrations by Edward Theodore Compton, of which no artist could speak too highly.

They are simply gems in their way, we have seen nothing superior to them in any work for the last five years, and Mr. E. T. Compton ought to be in much request as a book illustrator. The Mendip Hills include some of the most interesting geology to be had, and we are glad to see that Professor Lloyd-Morgan, the now distinguished scientist, has, as a labour of love, contributed to this charming work, a chapter on the geological history of the Mendips.

DRAGON-FLY GOSSIP.

By W. HARCOURT BATH, Author of "An Illustrated Handbook of British Dragon-flies," "A Label List of British Dragon-flies," etc., etc.

SINCE the appearance of my "Illustrated Handbook" in 1890, much original information has been obtained by myself respecting the beautiful insects in question, the result principally of practical work in the field and forest. For the benefit of those who are interested in our British Odonata it is my intention to relate my experiences in SCIENCE-GOSSIP from time to time, in the hopes thereby of creating a greater liking for them among entomologists.

Fig. 122.—*Calopteryx virgo.* (Reprinted from "An Illustrated Handbook of British Dragon-flies.")

The bibliography of our native dragon-flies is comparatively of such small dimensions that any additions thereto may probably not prove unacceptable by students. I hope, therefore, collectors will occasionally send some original notes and observations for publication in this widely circulating and excellent monthly, which is undoubtedly the most popular magazine of its kind in existence.

SOME MISCONCEPTIONS RESPECTING DRAGON-FLIES.

Strange as it may seem, there are many collectors of insects who are still under the impression that these innocent creatures can sting! deriving their notions no doubt from the popular idea respecting them; but first impressions die hard.

The number of species of dragon-flies inhabiting this country appears also to be greatly misunderstood, for not so long ago a person writing to a certain natural history magazine put down their total at eight; while another in a paper read before the Birmingham Natural History and Microscopical Society (and published in their "Transactions"), estimated them at two hundred; yet out of this great association, which counts between three and four hundred members, including several learned professors, there was not one who knew sufficient about these familiar insects to contradict the statement.

Their number in this country, as all dragon-fly students are aware, is forty-five, including several casual and accidental visitors.

THE PREDILECTION OF DRAGON-FLIES FOR PARTICULAR COLOURS.

Several instances of dragon-flies showing a fondness for certain colours are given in my well-patronised little handbook.

On one occasion I was in Wyre Forest hunting these beautiful insects, and while standing by the side of a stream where steel-blue demoiselles (*Calopteryx virgo*) were flitting about in abundance, I unbuttoned my jacket on account of the heat, displaying beneath a cream-coloured silk waistcoat, whereupon several specimens immediately settled upon it and appeared to be so interested with the article that they even permitted me to pick them up and replace them again without exhibiting any signs of fear.

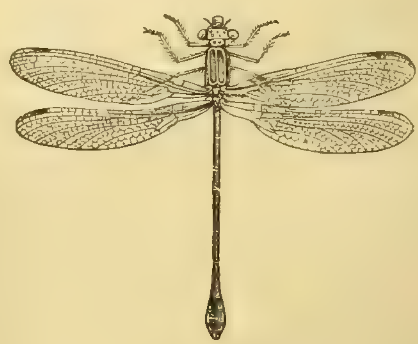


Fig. 123.—*Agrion puella.* (From Mr. Harcourt Bath's work.)

It is probable that the predilections of dragon-flies for particular colours will result in something being

invented by means of which those possessing a powerful flight may be procured with less difficulty than they are at present.

Dragon-flies Flying in the Rain.

This curious circumstance was witnessed by myself in August 1891, near Lyndhurst in the New Forest. One morning it turned out rather showery, but the showers were of very short duration although of frequent occurrence, and immediately they were over the sun would shine forth again in all his glory.

Fig. 124.—*Æschna cyanea*, together with its larva and pupa. (From same.)

Provided the rain was not too heavy certain species of dragon-flies, notably *Calopteryx virgo* and *Sympetrum vulgatum*, disdained to seek shelter, but kept flying about more or less the whole time, in company with various kinds of butterflies (especially *E. janira* and *E. hyperanthes*).

The fact was, it being such a wet summer, the poor insects were compelled to make the most of their opportunities and had consequently to be thankful for small mercies, like their relatives in high altitudes, as well as in certain sunless parts of the world. How readily can some species adapt themselves to adverse climatic conditions in comparison with others.

An Afternoon with Æschna grandis.

One calm morning, in the beginning of July, I packed up my "traps," and took the ten o'clock train from Snow Hill Station, Birmingham, to Solihull, which I reached in about half an hour's time. A sharp walk of a little over an hour's duration, through pleasant lanes, brought me to Chalcot Wood, near Earlswood, a famous Warwickshire hunting-ground for insects.

After arriving at my destination, the first dragonfly I saw was a fine specimen of *Æschna cyanea*, followed almost immediately by two others of the

same species, and a magnificent male specimen of *Platetrum depressum*, all of which I was fortunate enough to secure.

Butterflies of many kinds abounded hereabouts, including *Argynnis adippe*, *A. paphia*, *A. selene*, *A. euphrosyne*, *Erpinephele hyperanthes*, *E. janira*, *E. tithonus*, *Polyommatus phlœus*, *Cœnonympha pamphilus*, *Lycœna icarus*, *Gonopteryx rhamni*, *Pieris brassicœ*, *P. napœ*, and *P. napi*.

Proceeding through the wood, I presently perceived several more large *Æschna cyanea* engaged in aerial evolutions round a tall oak-tree. They were all apparently busy catching the flies and other insects, which were swarming over the foliage. Under another oak-tree, a little further through the wood, I soon saw a splendid specimen of *Æschna grandis*, similarly engaged. After three unsuccessful attempts to secure it, I managed to see it safely in my net.

About twenty minutes later on I encountered another example, but it proved far more difficult to capture than the preceding one, for it kept flying, nearly all the time, beyond reach of my net, but I had a nice treat for half an hour or so, in watching it chase its prey. The latter consisted of all sorts or insects, from small dipterous flies to large specimens of *Argynnis paphia*, and other butterflies which abounded in the wood.

After securing a large butterfly, it would fly to a tree, bite off the wings of its victim and swallow the body, apparently with great gusto.

Similar performances went on for some time, until the dragon-fly captured a fine specimen of *Pieris brassicœ*, which it took to a low branch of an adjoining tree. Waiting my opportunity, until the dragon-fly was fully engaged with its "joint," I crept cautiously up beneath the spot; one sudden well-aimed stroke with the net, and the prize was mine.

Both of the above specimens, together with a third example, which I obtained in the same wood, are exceeding handsome insects and would prove magnificent additions to my collection.

The same afternoon I secured specimens of several other species, as well as a good series of butterflies of various kinds, so that I returned home well pleased with the result of my expedition.

A full description and an account of the habits of *Æschna grandis* are given in my "Illustrated Handbook of British Dragon-flies," but I may here remark, that it can be readily distinguished from any other species of *Æschna* inhabiting this country by the colour of its wings. the veins or nervures of which are of a rich rusty red hue. It is, without doubt, one of the most handsome species in the British Isles, and is only eclipsed by one in size, namely *Anax formosus*, which is the largest British and European species.

In the expanse of its wings the Grand Dragon-fly measures about four and a half inches. Although fairly common, whenever it occurs it is rather local in its distribution. It is chiefly met with in the south of England being less seldom seen as one travels northwards. Its time of appearance in the *imago* state is from June to September. Although it may mostly be seen about during July and August.

I possess a fine series of this majestic species in my collection, which I may here remark, is open to inspection by readers of SCIENCE-GOSSIP at any time.

(*To be continued.*)

NOTES ON BRITISH DRAGON-FLY NAMES.

By W. H. NUNNEY.

"*TEMPORA MUTANTUR*" is an oft-quoted saying, and in the present case it suits to a nicety. The times are indeed changed. The age has become more exact, more scientific, and a finer spirit of classification is abroad, things of the present being subjected to searching analyses that would have shocked all but a select few in times gone by. This cult of exactitude has surrounded alike things both great and small, and none have escaped. The Dragon-flies, erstwhile banded together under the Linnean name of *Libellula*, have gradually been grouped into many genera with appropriate titles. The entire family have lately undergone thorough revision, and it has therefore occurred to me that a few words on the subject would not be out of place in this periodical. The major part of these changes having been embodied in Mr. W. F. Kirby's recently published "Catalogue of the Odonata," I shall offer no apology for appealing thereto when desirable.

Owing to the dragon-flies having received but little attention from entomologists, the names of the various genera and species, until comparatively recent times, were subject to a number of inconsistencies, which had been weeded out from other groups of insects. Such inconsistencies were the naming of a species without the publication of any description by which the insects might be recognised by entomologists succeeding the original observer, the not taking into consideration certain names which had a priority over others, and many other failures or breaches of system. Müller's writings were for a long time unknown to British entomologists, and his species and names were in consequence passed over, and their recognition somewhat upset the nomenclature aud classification of species. The synonyms both of groups and of species have now been most thoroughly worked out, thus placing the study of the Odonata on an entirely new and surer footing. Some of the older names that had sunk into oblivion are now revived, whilst others that have little or no claim for consideration have been discarded.

There has of late years been a growing tendency

amongst nomenclators to erect new genera out of old material, regardless of the fact that the types of older genera were frequently included in such new genera. For instance, the common flat-bodied dragon-fly, (*Libellula depressa*), taken by Linné as the type of his genus *Libellula*, was removed thence by Newman, who erected a new genus for the insect under the title Platetrum. Surely it is better for this species to be allowed to remain the pre-eminent type of the Odonata under its old name.

What has taken place with regard to the above-named species has been repeated in the treatment of some few others. Mr. W. F. Kirby writing on the subject, says "Latreille fixed the types of *Libellula*, *Æshna*, and *Agrion;* and therefore Leach's subsequent alterations in their use must be rejected. But to minimise the resulting confusion, the corrected form of the second name (*Æschna*) has been allowed to stand, as in popular use any addition to *Æshna*, which is co-typical with *Gomphus*, Leach, would be productive of ill, though strictly speaking it should perhaps have received a new name." The sole exception I have to this is that in use the names *Æshna* and *Æschna*, being somewhat alike in sound and spelling are liable to be occasionally misapplied, insects belonging to the genus *Æshna* being placed under *Æschna*, and *vice versâ*. This objection is not however, a sufficiently weighty one to invalidate the use of these names side by side.

I come now to the main portion of my subject, and propose to make a series of observations on the entire number of British genera, and of those species that have undergone changes of name, etc. I shall take the genera in the order of their classification to-day.

Family LIBELLULIDÆ.
Sub-Family LIBELLULINÆ.

LIBELLULA *depressa*, Linné. This insect has for a length of time been known as *Platetrum depressum*, but the generic name *Platetrum* has now been discarded for the reason given above.

LEPTETRUM. This genus, which was established by Newman in 1833, includes the two species of Libellula, *quadrimaculata*, and *fulva*.

ORTHETRUM, Newman. This genus stands. It includes the species *cœrulescens*, and *cancellatum*.

LEUCORRHINIA, Brittinger. This genus stands. It includes *pectoralis*, and *dubia*.

SYMPETRUM, Newman. Mr. Kirby writes of this genus, "Newman's name *Sympetrum*, to which Dr. Hagen objects because it was published unaccompanied by a description, in an English periodical unknown to Germany at the time, and was not subsequently used by Newman himself, has two of the strongest claims to be retained instead of *Diplax*, Charpentier,—firstly, that of nine years priority; and secondly, of having had a specific type assigned to it at the time of publication, which *Diplax* had not." *S. striolatum* is a synonym of *S. vulgatum*, which stands. The other British species, *meridionale*, *Fonscolombii*, *flaveolum*, *sanguineum*, and *Scoticum*, stand good.

Sub-Family CORDULIINÆ.

SOMATOCHLORA, De Selys Lonchamps. This is a corrected form of Charpentier's name *Chlorosoma*, which was preoccupied. *Cordulia metallica* is now placed under this head.

CORDULIA, Leach. This genus is now restricted to the typical species (*Ænea*) of the sub-family.

OXYGASTRA, De Selys Lonchamps. *Cordulia Curtisii* is now placed under this head.

Family ÆSHNIDÆ.
Sub-Family GOMPHINÆ.
Division Gomphina.

LINDENIA, De Haan. The species, known until recently as *Gomphus* (*Onychogomphus*) *forcipatus*, is now placed in this genus, which has a priority over *Onychogomphus* of twenty-eight years. Its new generic name necessitates a change of termination in the specific name, so that the species is now to be called *forcipata*.

ÆSHNA, Fabricius. This is the genus *Gomphus*, of Leach, who perverted its use. It includes *Gomphus vulgatissimus* (now *vulgatissima*) and *G. flavipes*, and has a priority of forty years over the name *Gomphus*.

Division Cordulegastrina.

CORDULEGASTER, Leach. This genus, with its species *annulatus*, stands good.

Sub-Family ÆSCHNINÆ.

ANAX, Leach. This genus stands, As regards the one British species known as *formosus*, Mr. Kirby thinks that the name should sink, and *Imperator*, Leach, take its place, as, although the latter name was published without a description of the species, "the characters of the genus, combined with the locality, are sufficient to identify the species intended." Leach's name has, besides, a priority of eight years beyond that of Van der Linden, so that the species must henceforth be known by its original name *Anax imperator*.

BRACHYTRON, Evans. This genus stands. The sole British species *pratense*, of Müller, should strictly be known as *hafniense*. *B. hafniense* is the female, and is described on page 61 of Müller's "Fauna Fridrichsdalina," whilst the male, *pratense*, is described on page 62. I think in such a case the name of the male may be allowed to stand.

ÆSCHNA, Fabricius. This genus stands good, but many changes have taken place in the nomenclature of the species. The name *Æ. coluberculus*, Harris, has a priority of twenty-three years over *Æ. mixta*

of Latreille. The species must therefore be known by the first-mentioned name.

Æ. squamata, Müller, has a priority of ninety-six years over the name *Æ. borealis*, Zetterstedt, therefore the latter name must sink.

Æ. juncea, Linné, stands, as also do *Æ. cyanea*, Müller, and *Æ. grandis*, Linné.

The name *Æ. isoceles*, Müller, has a priority of fifty-eight years beyond the name *Æ. rufescens* of Van der Linden; therefore the latter name must be discarded.

Family AGRIONIDÆ.
Sub-Family AGRIONINÆ.

AGRION, Fabricius. All the species of dragon-flies now known under the generic name *Calopteryx* must be transferred here, as the species *virgo* was Linné's type of the genus Agrion.

Sub-Family CŒNAGRIONINÆ.
Division Normostigmatina.

LESTES, Leach This genus stands good. The species hitherto known as *nympha* must in future be called *dryas*, Kirby, the first of the two names being inadmissible on several counts. The names of the other species, *barbara*, *virens*, *sponsa*, and *viridis*, stand good.

PLATYCNEMIS, Charpentier, and its species *pennipes*, hold good.

MICRONYMPHA, Kirby. This genus is usually known by the synonym *Ischnura*, Charpentier, which was, however, preoccupied. The species *pumilio* and *elegans* hold good.

CŒNAGRION, Kirby. The name *Agrion* being now in use instead of the sunk name *Calopteryx*, a new title had to be found for those small dragon-flies generally known as Agrions (*cyathigerum* excepted). The British species are *pulchellum*, *puella*, and *mercuriale*.

ENALLAGMA, Charpentier. This genus was erected for the *Agrion cyathigerum* of Charpentier.

PYRRHOSOMA, Charpentier. This genus stands good. The species generally called *minium* must drop its present name in favour of *nymphula*, Sulzer, which has a slight priority over the name given to it by Harris. *P. tenellum* stands good.

ERYTHROMMA, Charpentier. This genus, and also its species *najas*, stands good.

The general tendency of these changes is decidedly for the better, as their use in this country will bring our native entomologists more in touch with continental authors (except as regards the use of the names *Diplax* and *Calopteryx*) a thing ever to be desired and hitherto little attended to. We must not regard even the names given in this article as admitting of no further changes. Other material, of which we know nothing, may occur at any time, and this would, almost necessarily, upset the obtaining classification and nomenclature. There is, however, little likehood of such a thing taking place.

With regard to the changes in generic nomenclature, Mr. Kirby writes, "The limits of a genus are always variable and its characters subject to modification, both according to the increase of our knowledge and to the divergent views of different entomologists." The distinguished naturalist, Swainson once wrote, "Does there exist, in any class of the animal kingdom, a natural group, wherein *all* the species exhibit the *whole* of the typical characters? Every naturalist, every systematist, knows full well that no such group is to be found. It has been said by one of the most distinguished naturalists that this country has produced, that if a species possesses two out of the three characters of the genus in which it is placed, this is all we can expect; and the reason of this is obvious: if *all* the species possessed *all* such characters, then there would be no gradation of structure—no links in the chain of affinity—no loss of one structure—and therefore no taking up of another. Now, all this is diametrically opposed to facts; for the whole creation is but one connected chain of such graduated progressions, unequal, indeed, yet still graduated." This being so, the student must rest content with a correct knowledge of what is passing around him, and must go forward, adopting or rejectiug each new change as it occurs, guided by fixed, but not entirely arbitrary, principles of classification.

SCIENCE-GOSSIP.

MR. BALDWIN LATHAM recently delivered an address to the Meteorological Society, in which he showed that at certain seasons of the year it was possible to indicate the direction and volume of the flow of underground waters, even at a considerable depth, from the peculiar way in which fogs lie on the surface of the ground. These flows of underground waters are intimately associated with underground temperatures. At certain seasons of the year there is a check against the escape of the vapour arising from the waters, owing to the temperature of the ground acting as a condenser. In September and October the vapours have a chance of escaping, hence the peculiar lines of ground-fogs which mark those two months. There is no question that the heavy dews of September and October are largely due to the condensation of the uprising underground vapours.

PROFESSOR G. V. BOYS' discoveries in physics are all well-known to the scientific world. Our readers could not do better than procure the people's lecture he delivered at the British Association under the title of "Soap-bubbles," published as a half-crown volume by the Society for Promoting Christian Knowledge.

One of Professor Boys' most recent experiments is that of photographing flying bullets by the aid of an electric spark. This new trick in photography will make the next great European battle scientifically interesting. The speed of a bullet, great as it is, is nothing comparable to the short duration of Professor Boys' spark, which is less than the one-millionth part of a second. Consequently the flying bullets appear almost to be standing still. Photographs of these interesting experiments thrown upon the screen by the lantern and expanded into large pictures could even show how the electric spark photograph had caught a leaden bullet half-way through a plate-glass window. The picture was surrounded by a halo of lead vapour caused by the impact against the surface of the glass. The glass was also shown bulging out in front of another picture, and hollowed behind, just before the bullet passed through.

An important paper has been read at the Royal Society of Edinburgh by Dr. Hunter Stewart on the ventilation of schools and public buildings. It gives an account of his investigations concerning the origin of organic nitrogenous matter in expired air, and his conclusion is confirmatory of those of two eminent German chemists, namely, that the organic matter present in the air of badly ventilated rooms does not come from the breath of people, but from their skin and clothing.

There was a very sensible letter in a recent number of "Nature," in every respect except the political ægis under which it would put the subject. Parliament will be less entrusted in the future than it has been in the past, just in the proportion as the people manage themselves and do not require a political stepmother. The letter alluded to relates to a very common-place matter, but it is these which make up the incidents in human lives. It is estimated that 100,000,000 of parafin lamps are in use in this country. People who are not yet fifty years of age well remember the thin tallow candles (twenty to the pound), by the light of which a poor man tried to read a chapter in his Bible before he went to bed. Parafin is the poor man's gas. It lights up and cheers many a villager's home in places remote from gas. But parafin takes its annual tale of victims. Carelessness is responsible, of course, for most of them, for the oil is but its agent. It is computed that three hundred deaths a year are caused in this country thereby. Ten per cent. of the fires (according to Mr. Shean, of the Fire Brigade Association, are caused by parafin lamps. Captain Shaw, the gallant Ex-Superintendent of the London Fire Brigade, reported 156 fires in London in one year from the upsetting of parafin lamps. An automatic extinguisher could and should be attached to these lamps, and the letter-writer aforesaid thinks this ought to be done before a royal princess or a bishop is burnt to death.

In a lecture recently delivered at the Brooklyn Institute, Professor Houston stated his belief that people were now living who would see the steam-engine relegated to the iron scrap-heap, and that the motor engine of the future would be worked by thermo-electricity. He thought that a method would shortly be devised for converting the latent energy of coal directly into potential electrical energy. Electrical illumination is as yet but in the days of its youth, and ere long we shall get 97 and 98 per cent. of the energy converted into light, and only two or three per cent. into heat, unless we wish otherwise. Professor Houston further believes that, instead of regarding the human body as a vehicle for electricity, we should regard it as a generator.

"I like a couple of new-laid eggs for breakfast better than anything else, but in winter I can't afford more than one." Such was the remark made to us the other day by a well-known agriculturist. The reply naturally was, "Why don't you get a breed of hens that will lay as well, or nearly so, in winter as in summer?" The fact is the natural history of our farm-yard fowl has never been practically studied in England on a sufficiently comprehensive scale. We forget that these birds came from India. The originals are there represented by the jungle fowl, which in England are most nearly approached by our game bantams. Consequently, our barn-yard fowls ought to be protected from as much cold, and afforded as much warmth in winter, as possible. Instead of this what do we see? The miserable wretches with snow-sodden and rain-sodden plumage, sheltering under the cold hedges, and trying to manufacture eggs out of horse-droppings. Under these circumstances is it any wonder that new-laid eggs are dear in winter, or that people who eat one for breakfast shortly afterwards wish they hadn't? We are contemplating fowls only as egg-layers, without reference to them as delicious animal food. Poultry-keeping ought to be, and in France and Italy is, in village places, a most profitable industry—so profitable that although fowls and eggs appear on the dinner-tables in those countries more frequently than in England, they have enough over to supply this country with. Last year the United Kingdom bought from foreigners 4,000,000*l.* of eggs and poultry. Even poor old Ireland sent us nearly 2,000,000*l.* of the same articles. Mr. Edward Brown, who was last winter elected by the Northumberland County Council as Lecturer on poultry, states that poultry can be reared as successfully in Northumberland as in Normandy, and in Aberdeenshire as in Central France. In France, poultry-fattening is chiefly entrusted to the women, who naturally like to see young things feed. In England,

Devon and Cornwall are the only counties which supply themselves with eggs and poultry, and have sufficient left over to export to the rest of England, Surrey and Sussex devote themselves chiefly to table-poultry, and last year one district alone, that of Heathfield, sent up 70,000*l.* of fatted chickens. East Anglia contributes splendid geese and turkeys, no other part better, whilst Buckinghamshire is famous for its Aylesbury and other ducks. The cottagers who rear ducklings are there called "duckers," and make 40,000*l.* a year out of the job. It is evident that the old cry that poultry don't pay depends upon the keeper. Russia and Canada are much colder countries than Great Britain, and yet they manage to export eggs at half the price of our new-laid ones. The question of poultry-breeding and eggs ought to be prominently brought before the notice of our village population by all Technical Education Committees of County Councils. There is not the slightest reason why our agricultural labourers should not add at least five shillings a week to their income by keeping fowls and selling eggs. The secret is in knowing how to do it, and in taking a little trouble. Then we would back the hens against the pig.

A NEW invention hails from Paris, apparently based upon our system of slip-carriages on fast railway trains. It is an apparatus by which the driver of a vehicle may release it from runaway horses. This releasing action takes place in the traces, so that, with a simple mechanism, the driver can, by pulling a strap, work a spring buckle fixed at the end of the traces so that they fall to the ground, the horses being released by other spring buckles. This mechanism cannot be put in action accidentally during ordinary driving. This invention sounds feasible, but evidently it could only be applied to four-wheeled carriages; and one wonders what the effect upon the fast-driving carriage the release of the runaway horses would be, unless the driver was also provided with a brake. Also, where would the released and mad horses steer to, and amongst whom?

MOUNT ETNA is (at the time of writing) in a state of energetic eruption, more active than has been known for nearly twenty years back. The lava streams have descended to a lower level than heretofore.

THE British Association Meeting at Edinburgh this year appears to have been, in every respect, a great success. The "Reports" of the President's Address and the addresses of the various presidents of sections have been published at 1*s.*, and we recommend our readers to get a copy. (Spottiswood & Co., New Street Square, London.)

THE REV. H. H. WINWOOD, F.G.S., has just written a charming account of the late "Charles Moore, F.G.S. (of Bath), and his work," to which is added a list of the fossil types and described specimens in the Bath Museum, by Edward Wilson, F.G.S.

MR. L. UPCOTT GILL has issued a capital illustrated little manual (price 1*s*), entitled "Butterfly and Moth Collecting," by George E. Simms.

ANYONE who has tramped through the country districts of France cannot fail to have been struck with the comparative absence of small birds. He may tramp for miles in some places without seeing anything but a couple of magpies. Nearly every bird is a game-bird to the French peasant, and finds its way into the pot. Nature, however, is not to be trifled with. Her revenge is sure, and she can wait for it. Protectors of small birds are not wanting among the French naturalists. Bird extermination has been coped with by the law, but evidently the flavour of the pot is overwhelming. At any rate, a French scientific journal states that the laws against bird-destruction are openly violated by the peasant farmers. Three-fourths of these birds are known to feed on insects. The local extermination of these natural destroyers means an enormous and overwhelming development of insect life. In consequence, the cultivation of wheat is becoming less and less remunerative, and one of the causes of this is traceable to the destruction of larks, whose food largely consists of the larvæ of a small beetle which commits extensive ravages on the roots of wheat plants. The vine-growers of France are also uttering protests against the destruction of small birds, and they state that nowadays there is scarcely any bird-life visible in their vineyards.

EVERY man who reads the agricultural newspapers has heard of the experimental farm at Rothamsted, where for more than a quarter of a century Sir John Lawes and Mr. R. Warrington have been conducting experiments, at their own expense, which have proved of the highest value to scientific agriculture. The information gained from the experiments has been freely given to the world, and hundreds, if not thousands, of thoughtful farmers in this country are grateful for it. Mr. Warrington's name is associated with the discovery of the nitrification of the soil, one of the most valuable discoveries for the world which patient science has ever given to it. His name is as well, if not better, known in the United States as in Great Britain. He has been lecturing by invitation before the Association of American Experiment Stations, and so much value has been set upon these discourses that the United States Department of Agriculture has published a report of them for general distribution at a remarkably cheap rate. The United States possess upwards of 50 Agricultural Experiment Stations, each of them endowed with an income, equal, or surpassing, that possessed by Rothamsted. In England we have only

one such station endowed and superintended by the munificence of one man, and yet our agriculturists are nearly all Conservatives.

It has been found that, practically, the fat globules which float in milk are of three different sizes. The Continental agriculturists attach a great deal of importance to this fact, for it has a good deal to do with the manufacture of butter. The larger globules ascend to the surface first to form cream, pushing the smaller ones aside in the process. When the milk is skimmed, the smaller globules have a chance, and ascend to form a second and a thinner surface layer. These different-sized fat-globules have been found to vary in different breeds of cows. Some yield an excess of larger globules, and others of medium-size, and the third of small globules. There is consequently some reason in the old query addressed to country boys, as to which cow it is which gives the cream? Jersey and Durham cows yield the largest fat-globules in their milk, Swiss and Brittany cows a preponderance of middle-sized ones, and Dutch and Flemish cows the smallest. Nevertheless, it would appear that the smallest-sized globules are richest in fat, and the milk containing them is therefore the best for butter-making. In the latter process, however, it is found convenient to add milk containing large globules on account of their causing the butter to gather together all the quicker during the process of churning.

The western part of the United States is a happy hunting-ground for the geologist. The United States Government, with characteristic generosity, commissioned Professor Marsh to have the fossil vertebrate animals collected. One of the favourite geological hunting-grounds is the region lying between the Rocky and the Wasatch mountains. Professor Marsh speaks of one valley where he saw no fewer than six entire skeletons of the fossil sea-serpent (*Mososaurus*) averaging eighteen feet in length. It is millions of years since these fossil reptiles swam the ancient seas.

The uses to which photography can be applied are multiplying every day. It is only seven years since it was applied to astronomy, and behold the number of known stars has increased thereby to millions. Instantaneous photography has taught us the real origin of animal locomotion, whereas before we only knew the apparent. Now it has just been applied to record the movements of the growing parts of plants. Some curious results are recorded, especially with such climbing plants as the hop-convolvulus, ipomœa, etc. The movement of the young stems consists of a succession of irregular, circular, or elliptical curves, which vary every moment, even in their direction. They are caused by unequal growth in different parts of the stem. The sleep movements of plants have also been photographed. They are not interrupted, as was supposed, but consist of alternate upward and downward movements, which become smaller in the space they move in and of greater frequency as they progress.

We have entered into the "Age of Steel," thanks to Sir Henry Bessemer. In an article on "The World's Shipwrecks," published in *Engineering*, there is a remarkable tribute to the superiority of steel over iron in the construction of vessels. More than a thousand ships are wrecked every year, totalling 650,000 tons. Nevertheless this only amounts to between three and four per cent. of the shipping afloat. It is in favour of steel that of the total tonnage annually lost only 12 per cent. of the vessels were constructed of this metal, against 41 of iron and 47 of wood.

We strongly recommend our microscopical readers and students generally to use the Electro-lacquerine, brought out by Mr. C. H. Hesketh Walker, 12 Church Street, Liverpool. It is a most valuable aid to a working microscopist, as the slightest varnish of it prevents rust and tarnish of all kinds of metal work. It is easily used, and the preparation is remarkably cheap.

MICROSCOPY.

We have received the July number of the "Journal of the Quekett Microscopical Club," which contains the following papers:—E. M. Nelson "On Striped Muscle of a Pig;" H. Morland, "On Mounting Selected Diatoms;" E. M. Nelson, "On Finding Refractive Indexes of Mounting Media;" R. T. Lewis, "Notes on a Species of Ixodes;" D. Bryce, "On the Macrotrachelous Callidinæ;" T. H. Buffham. "On Chantransia Trifila;" T. H. Buffham, "On the Conjugation of Orthoneis Binotata;" Dr. W. H. Dallinger, "President's Address, 1892;" E. M. Nelson, "On Binoculars;" E. J. Scourfield, "On British Cladocera."—*F. H. Ward.*

Restoration of Slides attacked by Fungus-growths.—Doubtless many have noted with regret the spoiling of many an opaque or dry slide by Fungus-growths. It occurred to me to try whether I could not restore these by means of carbolic acid: I think I have succeeded. My plan is this. I take off the glass cover, and put the object, whether vegetable, or Polyzoa, into pure carbolic acid. I leave it there for some three seconds; then plunge it into pure water, to get rid of the carbolic, for about ten seconds; then take it out and dry it as well as possible, and put it into a little book of blotting-paper till all moisture is gone, and it is perfectly dry again. I have been well satisfied with the results so far, and should be glad if some of your readers would

try and thus save some of their valuable slides, and give us the results of their work. I have had long to mourn over slides spoilt by fungus-growths; I trust I have now remedied this.—*A. C. Smith, Crowboro'.*

MASON'S PROJECTION MICROSCOPE.—I have had occasion, during my last lecturing season, to use one of Mr. R. G. Mason's instruments as above described, for illustrative purposes. I have used ordinary microscopic slides, suitable for a 1-inch objective for a projection upon the screen, although the 1½ and 2-inch powers are better for projecting objects that are not too opaque. Mr. Mason provides an alum trough for barring out heat-rays, but I found that my lantern slides, particularly with a 2-inch object-glass, would stand two minutes well without injury. The alum trough necessarily means lowering of illuminative lantern power. There are few things which impress audiences more powerfully than the fact, that when they see a picture upon a lantern screen it is the real image of the object lectured about, and not a mere drawing. Having used Mr. Mason's lantern microscope, I am prepared to recommend it, and to thank him and other opticians for their highly appreciated help in bringing out such perfected instruments for the aid of scientific lecturers.—*J. E. Taylor, Editor S.-G.*

ZOOLOGY.

PRESERVING THE EPIDERMIS OF SHELLS.—"A solution of chloride of calcium has been employed by Gen. Totten, U.S. Engineers, for preserving the flexibility of the epidermis in various shells. The solution of this deliquescent salt—which any one can make by saturating hydrochloric acid with marble—keeps the object which has been steeped in it permanently moist, without injuring its colour or texture; while its antiseptic properties will aid in the preservation of matters liable to decay. (Professor J. W. Bailey, in 'Gilliman's Journal,' July, 1854.)" Will anyone kindly say whether the above—given in "Woodward's Manual of the Mollusca"—is much used, and would a solution made from chalk with nitric acid answer the same purpose."—*W. Jones, jun.*

THE CINNABAR MOTH (*Euchelia jacobeæ*) AND ITS VARIETIES.—The Cinnabar Moth (*Euchelia jacobeæ*) is familiar to every one, and almost equally well-known is the larva, with its alternate rings of orange and black, and few scattered, bristly hairs, to be found feeding plentifully on groundsel (*Senecio vulgaris*) in the spring. Very beautiful is the moth. The rich carmine streaks and spots, and rather lighter under-wings of this colour, forming a charming contrast with the soft ground-colour of the primaries. The moth is interesting, too, from the fact that, contrary to what is usually the case with the lepidoptera, the males are larger than the females. Though liable to be overlooked at first sight, the colours of the two sexes are not identical. The females are decidedly brighter, the carmine of both wings being more intense and vivid, whilst perhaps that of the males, particularly that of the secondaries, might appropriately be designated crimson. *Euchelia jacobeæ* is not much given to variation. I once saw a remarkable specimen in which all the wings were well-nigh suffused with the dull, smoky ground-colour, the carmine showing only as a faint, dingy pink, "looking," as the captor expressed it, "as if the moth had been passed up the chimney." Xanthic forms, like Zygœnas, may occasionally be bred, and found. I have had the pleasure of adding one of these yellow, or more correctly orange varieties, to my collection during the past season. It was taken in the garden of our neighbour, Mr. Alderman Purchase, by his son, and my esteemed young friend Edgar—an ardent, and intelligent observer of nature, to whom I am much indebted for assistance in my collecting. The specimen is in fine condition; the state of the cilia suggesting recent emergence. All the carmine of the wings is replaced by yellow, or orange. I almost regret that I did not try for eggs; but in all probability I should not then have had so lovely an insect gracing my cabinet. A good instance of protective resemblance was afforded by *Euchelia jacobeæ*. A specimen at rest on a dark red brick wall assimilated in tints so wonderfully to its surroundings as to be scarcely perceptible. The largest male in my series measures exactly 1¾ inch, my smallest female 1¼ inch from tip to tip of wings extended.—*Joseph Anderson, Jun., Chichester.*

FUSUS TURTONI.—A fine live specimen of this rare shell, was found by me, during a trip on a steam trawler, the other week, seventy miles east of Aberdeen; depth of water, 40 fathoms; ground fine sand. There is no mention of this Fusus, either in McGillivary's nor Dawson's lists of mollusca for the north-east of Scotland.—*James Simpson.*

THE "VEGETABLE CATERPILLAR."—We have received from Messrs. Kelsey & Co., Auckland, a specimen of the above, with the following note.—*Cordyceps Robertsii*, or the vegetable caterpillar, is a most interesting curiosity, peculiar to the North Island of New Zealand, and called by the Maoris in one province "Hotete," and by others "Awhete." At a certain season the spores of a fungus, which are so very infinitesimal as to be almost imperceptible to the human eye, float in the atmosphere, and enter through the breathing pores of its body and commence to germinate. The grub then buries itself and dies, being, in fact, killed by the growth of the fungus inside it, and which ultimately sprouts from one end of the caterpillar's body, growing to a height

of six to nine inches or more. The greater part of the body of the caterpillar has now, through the growth of the fungus, become converted into vegetable tissue, hence its name "Vegetable Caterpillar." These specimens may be obtained of Messrs. Kelsey & Co., Auckland, New Zealand.

BOTANY.

THE GENUS OROBANCHE IN GREAT BRITAIN.—Orobanche, a genus of herbs parasitical on the roots of other herbs, or shrubs, is represented in our Floras by 7–11 species, according to the text-book we take as our guide. In the fresh state they are not very difficult to determine, but when dried are very so. The flowers should be dried separately, between pink blotting-paper, on the outside of which a thin sheet of wadding (cotton-wool) should be laid, and then put between the usual drying paper. So far as my own experience leads me to judge, they are not so often gathered as many other genera; and having just determined a species new to our Flora, I am very desirous of seeing as many of the genus as possible. I will gladly name any sent to me, asking that when sent it should be stated whether they are to be returned, or not—time, place, and county where found are needed to be clearly stated.—*Arthur Bennett, Croydon.*

VEGETABLE TERATOLOGY.—I have forwarded to you to-day some heads of a monstrosity of white clover (*T. repens*) which I found by the side of a road at Birchington, Thanet, on July 25th. You will see that in many cases the teeth of the calyx have developed each into a single leaflet. like, but much smaller than, the leaflets of ordinary leaves. The ovary in some cases is elongated, protruding from the standard, but in others is further developed into a folded or into a boat-shaped leaflet, or further still into a flat leaflet on a long stalk. There was a large patch of this clover. Most of the flower-heads were normal, but there were also many like those I have sent to you.—*Frank Sich, Jun.*

NASTURTIUM SYLVESTRE, Br. This plant is fairly abundant about Highgate: it may be found in woods, on dry roads and banks, growing in large tufts; there is a large tuft of it on a bank at the foot of a bridge on the G.N.R., near Highgate, which I conclude is the same tuft as mentioned by A. E. Hudson, p. 22. The two inner pairs of stamens opposite the two lateral sepals afford a good example of "collateral chlorisis" which is almost universal in this natural order. They are sometimes wholly coherent while at other times only partially so.—*H. E. Griset.*

VAR. OF L. OVATA.—The variety of *Listera ovata* figured in your last number is not uncommon. I have a Yorkshire specimen in my herbarium, which only differs in the fact of all the leaves being of the same size. A similar abnormal form of *Paris quadrifolia* is even more common. I have found the latter with from five to seven leaves.—*J. A. Wheldon, Walton, Liverpool.*

NOTES AND QUERIES.

A NEST IN A POSTAL STORE.—The following is well authenticated. There is a niche used as entrance to a letter-box in the Bushey Park wall, Hampton Court road, Hampton, adjacent to the head keeper's residence. There are four postal deliveries a day, and on nearly every occasion a collection of private or official letters, packets, etc., are pushed through. Mr. Halliday, the head keeper, some time ago noticed a few hairs, bits of moss, dried grass, feathers, etc., at the bottom of the letter-box, which is of ordinary size. He did not root the unusual *débris* out, but waited and watched, ultimately discovering that a pair of great tits (*Parus major*) had fixed upon the box for domestic purposes. The birds built a commodious and handsome nest—the female laid five eggs and ultimately brought out five beautiful weenie nestlings, now nearly ready to take flight. All the time the construction of the nest was in progress, during incubation, and while the young tits were being reared, letters, etc., were regularly dropped into the box, but not all on to the nest, for Mr. Halliday considerately placed a few convenient twigs above it to break the fall of the heavy packets. Most friendly and amicable relationship exists between the keeper and his pets (although he does grow peas in his garden), the parent birds even allowing him to fondle them, and they feed their young while he is looking on.

TERMITES.—When I first arrived in India, I heard a good deal about white ants, I was told that they not only devoured wood and cloth, but that they bored through the solid walls and concrete plinths of the bungalows; and that, besides this, they seemed to possess some sense unknown to us, as, if a garment were hanging against the wall, the white ants would throw out a gallery from the wall immediately behind it; while no such galleries were thrown out from the portions of the wall where nothing was hanging; similarly, when some wooden article of furniture, such as a table, remained for any length of time without having been moved, it would often be found that they had driven a gallery through the plinth, and up one of the legs, so that it would often be found that the whole inside of the table had been eaten away, leaving the exterior perfect.

This seemed to me very extraordinary, so that I carefully observed the habits of the white ants. It is true that they bore in all directions through the walls of the bungalows, but as these walls, though massive in appearance, are usually made of sun-dried bricks, but little harder than mud, the fact is not so extraordinary as it at first appears; it is also true that they bore through the concrete plinths, but the hardness of these is entirely superficial: the interior is comparatively soft and friable, moreover, the hard exterior coat is broken up by numerous fine cracks, which are utilized by the termites. Now, as to the instinct, or sixth sense, said to be possessed by the white ants, the facts at first seem more wonderful, and more difficult to explain. I found by observation

however, that they are continually putting out tunnels from all parts of the wall; where this is an exposed part, their tunnel is either broken down by the servants in sweeping, or abandoned by the white ants themselves, in consequence of light, before it attains an appreciable length; in my verandah at Allahabad, I told my servants not to destroy the white ant tunnels; in consequence, although the light must have been somewhat a drawback, at least twenty tunnels were thrown out from the wall, and continued to a length varying from four to nine inches. These tunnels were perfectly objectless, as there were no clothes or furniture in the verandah for the white ants to attack. I found that the longer tunnels were curved upwards, so as to form about a quarter of a circle. With reference to the tunnels pushed up from below, through the plinth, the same explanation holds. The white ants drive their tunnels quite at random; if a tunnel emerges in the open part of the room, it is trodden down before it has got long enough to attract notice; if it emerges under a table or similar article, the servants destroy it when sweeping; and it is only those which escape, through being sheltered by the leg of a table or in some like manner, which subsequently attract notice.—*J. R. Holt.*

NOTES ON ALDEBURGH.—Aldeburgh is a small town on the coast of Suffolk, facing due east. It is a place of some antiquity, as is evidenced by its possessing a mayor and corporation, as well as by the Moot Hall, a curious old building of timber, brick, and flints. The church, which is large and in good preservation, is also built of flints. The river Alde flows from the west towards the town, but instead of running into the sea at Aldeburgh it turns abruptly to the south, and flows for several miles, only divided from the sea by a bank of shingle. The tidal estuary thus formed is a fine sheet of water, and being well protected is much frequented by yachts and pleasure-boats. Many brackish-water shells are to be found here, particularly *Mya arenaria*, *Scrobicularia piperata*, *Hydrobia ulvæ*, *H. ventrosa*, *Melampus myosotis*, *M. bidentata*, *Utriculus truncatulus*, *U. obtusus*, etc. *Hydrobia ventrosa* occurs occasionally with the last whorl quite separated from the next. There are but few shells on the sea-shore, as there is not much sand. North of the town *Pupa marginata* lives on a piece of sandy ground together with an almost endless variety of *Helix virgata*. The geology of Aldeburgh is of some interest. There is a fine section of the Coralline crag on the Leiston Road, which yields numerous corals and bryozoa, with a few shells. Other sections of both Coralline and Red crag are to be seen in the neighbourhood. Off the coast there appears to be an ancient forest-bed, as large masses of peat containing tree-roots are washed up on the shore to the north of the town. Some of these lumps of peat are full of *Pholas candida*. The tide also brings up the fruits of a coniferous tree, which probably came from the same bed. Wild-flowers abound at Aldeburgh. *Carduus nutans* grows in great profusion, and bears very fine flower-heads, which are occasionally white. *Onopordon acanthium* is also abundant. *Glaucium luteum*, *Senecio viscosus*, *S. silvaticus*, and *Convolvulus soldanella* grow near the sea on the north side of the town. *Sisymbrium sophia* and *Cichorium intybus* are fairly common on the road-sides, together with many other plants.—*J. E. Cooper.*

UNKNOWN INSECT.—As I am known to most people in this district as a sort of harmless lunatic who spends some of his leisure in grubbing about ponds and ditches, and the remainder in "staring down a brass pipe," and who is also credited with an almost unlimited knowledge of beetles, bugs, and "wick things" generally, I am sometimes consulted as to the identity and characteristics of various beasts and insects which occasionally find their way into human habitations. A working-man's wife has been to consult me several times, with reference to some small insect, which I failed to make out from her somewhat imperfect information. However, as she somewhat whetted my curiosity last week by saying the insect was swarming in thousands, all over her sitting-room furniture, I resolved to humour her by paying a visit of investigation. After business I went to the place, and a hunt with a candle soon showed some hundreds, about a dozen of which I secured with a wet camel-hair pencil. A microscopic examination enables me to give a diagnosis of the insect, which is quite unknown to me. Very active, dirty white insect, roughly, about the size of the head-louse (*Pediculus capitis*); head somewhat triangular, widest behind; eyes two, compound of numerous facets, situated at posterior angles of head; antennæ setaceous, as long as the whole insect; maxillary palpi four jointed; mandibles two large curved hooks; thorax narrower than base of head, cylindrical, of about four segments; abdomen of about seven segments, oval, and in young specimens pointed posteriorly; legs six, as long as abdomen. slender; tarsi three jointed; claws two. The limbs, and indeed the whole insect, covered with short hairs; the smaller specimens are slenderer than full-sized ones. I have drawings of two of these insects, but the above description will probably be sufficient for their identification. So far as I could learn, none of the other houses in the row were infested, and few were found in any part of the house other than the sitting-room. I was informed that they appeared immediately after the purchase of some hair-seated furniture, and was shown many places where the seating was in holes, which the woman was convinced were caused by the insect invaders. I should be glad if any of your numerous entomological readers could identify the insect for me.—*J. E. Lord*, *Rawtenstal.*

BLEACHING FERNS.—Could any of your readers inform me how to bleach ferns? I have tried and cannot make a success of it.—*A. N. Z.*

HOLLINWOOD BOTANISTS' GARDEN.—The "Oldham Microscopical Society and Field Club," recently visited the Botanists' Garden, Hollinwood, snugly situated a short distance off the bottom end of Hollins Road. The visit was paid for the purpose of seeing what had been accomplished by the botanists of that district during the last half-dozen years in the way of cultivating British wild plants. The report goes on to state that a glance from the outside gave an impression that the garden differed little from other similar places to be seen in suburban lanes of many Lancashire towns, gardens in which white roses, lupines, orange lilies, willow herbs, thrift, sweet-williams, and a score of other good old-fashioned favourites vied with each other in giving all possible gaiety to the little piece of ground that nourished them. As soon as entered, the garden was found to possess an individuality of its own. The closer it was examined the more evident it became that there were to be recognised forms that the visitors had only met with occasionally in their country rambles, or that they had scanned with half-hearted interest in various herbariums. The inspection began by sauntering along one side of an open channel, smelling suspiciously of sewer water, that ran through the garden, and which the botanists had

done their best to ingeniously screen with masses of dwarf elder and other like plants crowded together. The two pools in the gardens next drew attention, after which "the modest-looking greenhouse" was visited. The walls were embellished with pictures of florists' flowers torn from garden periodicals. On again looking over the open grounds it was observed that the Hollinwood botanists had begun a good piece of work in arranging their plants according to the natural system, in separate beds. Near the gates were pretty purple blossoms of the meadow geranium, the ground about them being dappled with many of their fallen petals.

LISTERA OVATA (MONSTROSITY).—In my herbarium I have a specimen of *Listera ovata* even more remarkable than that figured by Mr. Provis in your August issue. Mine has four leaves, two lowest alternate, two upper sub-opposite. I also have another similar to your figure, but the two lower leaves alternate instead of sub-opposite. Once I saw a specimen with five leaves all alternate ,but being so far from home, and being loaded with other plants, could not then take it; upon returning a few days later the plant had withered. I have often seen these plants with three leaves, but always growing in luxurious soils in woods, etc., never in barren, open places. The normal plant has its two leaves not exactly opposite but sub-opposite, therefore, the rich soil, etc., would have a tendency to develop the nascent internode. Morphologically, the upper leaves seem to be bracts, enlarged by the rich surroundings of the plant. My specimens bear these enlarged bracts in the position the normal ones occupy in a normal plant. If you would like to see my specimens, should be pleased to forward.—*G. T. West.*

ALBINO FLOWERS.—On August 1st I found growing on the limestone at Brassington Rocks, Derbyshire, several specimens of *Geranium pratense* and *Centaurea scabiosa*, with pure white flowers in both cases; there were plenty of the normal-coloured flowers growing near.—*Jno. E. Nowers.*

ELECTRICAL WATER-POWER. — Gradually the world will avail itself electrically of water-power. There is no reason why it should not. The mechanical ability of water to turn mills has been practically known in this country for more than a thousand years back. Some day the electrician will enlist the services of the wind to produce electrical light and power. Even then he will only be applying a very ancient and simple method of energy, everywhere known as the windmill, to a modern and specialised form. Half a dozen years and more ago, one of our daring young electrical engineers declared that the wasted energy of the 40-foot tide, which rushes up and down the Severn, twice every twenty-five hours, was equal to half the factory-power of Great Britain. The day will come when electricity will make the world independent of coal-fields.

ELECTRICAL TRANSMISSION OF ENERGY.—At the celebrated falls of the Rhine at Schaffhausen, an electric transmission has now been constructed for propagation of energy by wire-rope transmission. The power is derived from two turbines, and is transmitted across the Rhine, a distance of nearly half a mile, at 624 volts. The current drives a spinning-mill, in which the largest motor is 380 horse-power. The power is sold, I believe, at £3 per horse-power of the motors per annum. Indeed, Swiss water-power is now rapidly being utilised for electrical purposes. The Falls of Niagara are also being laid under contribution. If the whole stream could be utilised, it would supply seven million horse-power, which is double the total steam and water power at present employed in all the manufacturing industries of the United States! In the words of Prof. Unwin, president of the Mechanical Science Section, at the recent British Association meeting, Niagara is likely to become not only a seat of large manufacturlng operations of familiar types, but also the home of important new industries.

IMPROVED ARC-LAMPS.—In electrical lighting, arc-lamps were the first to be used and the first to be improved. They are far from being perfect yet, and it is pleasant to see that scientific attention has recently been drawn to their improvement. Indeed, an altogether new kind of arc-lamp is announced. the chief peculiarity of which is that it possesses *curved* carbons. The points of contact are at the bottom of the lamp, so that no shadow is thrown underneath it.

RESTING myself amongst the grass in a pasture-field lately, I began to note the different plants of which it was composed, and was surprised to find I could make out thirty-six without shifting my position. I send you a list. The field was laid down in pasture six years ago and sown only with *Lolium perenne*, which is now very thinly mixed with the others. *Lolium perenne*, *Cynosurus cristatus*, *Holcus lanatus*, *Poa trivialis*, *Poa annua*, *Agrostis vulgaris*, *Trifolium pratensis*, *Trifolium repens*, *Trifolium procumbens*, *Lathyrus pratensis*, *Vicia cracca*, *Lotus corniculatus*, *Lotus major*, *Ranunculus acris*, *Potentilla anserina*, *Potentilla tormentilla*, *Plantago major*, *Plantago lanceolata*, *Apargia autumnalis*, *Bartsia odontites*, *Prunella vulgaris*, *Cerastium viscosum*, *Bellis perennis*, *Rumex crispus*, *Rumex acetosa*, *Cnicus lanceolatus*, *Veronica serpyllifolia*, *Centaurea nigra*, *Achillea ptarmica*, *Luzula campestris*, *Juncus acutiflorus*, *Iris pseud-acorus*, *Equisetum arvensis*, *Carex glauca*.—*P. Wright, Ayrshire.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

TO ANONYMOUS QUERISTS.—We must adhere to our rule of not noticing queries which do not bear the writers' names.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply DISGUISED ADVERTISEMENTS, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges," which cannot be tolerated.

WE request that all exchanges may be signed with name (or initials) and full address at the end.

SPECIAL NOTE.—There is a tendency on the part of some exchangers to send more than one per month. We only allow this in the case of writers of papers.

TO OUR RECENT EXCHANGERS.—We are willing to be helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

F. W. MACKENZIE SKUES.—You had best offer the ten vols. of SCIENCE-GOSSIP in exchange, or advertise them for sale.

G. W. RAPER.—Thanks for your very pretty sketch of the monstrous foxglove. The flowers are very liable to sport terminally when grown in gardens.

T. POSTGATE (Carlisle).—We do not think the fossil sent us was found in your district. It is very fragmentary, and most closely resembles one of the turrulites from the lower cretaceous beds.

I. B. DOWDLE (Melbourne).—Address Secretary of Royal Microscopical Society, Burlington House, London; Hon. Sec. and Editor of Quekett Club, 15 Westfield Road, Hornsey, London, for your fullest information. The "American Microscopist" is published in London by W. P. Collins, 157 Great Portland Street, from whom you can have all periodicals.

A. E. BROTHERS.—There is a book on "Pebbles" published, with coloured plates (by either Routledge or Warne), but the descriptions are very misleading. You had best address a query to our columns.

M. L. SYKES.—Shall be very pleased indeed to accept the moths.

I. H. SMITH (Barbadoes).—The following are excellent books:—Thorne's "Manual of Botany," edited by A. W. Bennett (London: Longmans); Nicholson's "Manual of Zoology," last edition (Blackwoods). Neither very expensive books, and both among the best. Write to the Secretary of the Quekett Microscopical Club, 15 Westfield Road, Hornsey, London.

L. GREENHALGH (Middleton).—We are always pleased to get these floral "monstrosities" collected and sent by the collectors. They are no longer "freaks of nature;" that explanation is not good enough. They relate to some past stage in the biological history of the order—sometimes possibly they are a forecast of biological changes yet to come. The common daisy is more liable to "sport" than perhaps any other member of the Compositæ.

MR. HARRY BURNS, of the Free Library, Fulham, S.W., is anxious to procure a colony of living ants (*F. sanguineum*), and their slaves, *F. fusca*. Will some correspondent kindly communicate with him, and if possible, send him a colony?

T. M. JONES.—The specimen of proliferous growth in a rose is one of the most remarkable instances of vegetable teratology we have seen. It is almost a duplicate of the well-known "Hen-and-Chickens" Daisy in the Compositæ. Many thanks for the specimen.

I. B. C. (Salford).—You are correct in your surmise. The plant is the beautiful flowering rush (*Butomus umbellatus*), rare in Lancashire, but abundant in the rivers and dykes of East Anglia, where cartloads of them could be easily procured.

EXCHANGES.

OFFERED, 31 vols. of Jardine's "Naturalists' Library," first edition, 1834 (scarce), containing 1036 exquisitely finished plates, accurately drawn and hand-painted, besides numerous woodcuts, together with steel engraved portraits and memoirs of thirty-one eminent naturalists. Wanted, theosophical and philosophical works.—D. S. Steuart, North Leigh, Prestwich, Lancashire.

FOR exchange, duplicates from a private museum, specimens from Colonial and Indian Exhibition, shells, fossils, &c. Desiderata, fossils. Lists on application to—Miss B. Y. Cresswell, Sugellay House, Teignmouth, Devon.

OFFERED, *Isocardia cor* (dead), *Acme lineata*, var. *alba*, and many other rare shells. Wanted, *Limnæa involuta* and *Succinea oblonga*.—G. W. Chaster, 42 Talbot Street, Southport.

OFFERED, SCIENCE-GOSSIP for 1886 (except January), 1887 (except December), and parts 239–242; also fossils from the Gault and carboniferous. Wanted, lignite, peat, anthracite, native alum, native nitre, and Cornish rocks and minerals.—E. Dixon, 55 Brownhill Road, Catford, S.E.

WANTED, British shells in exchange for complete set of "Review of Reviews," and other good books, foreign stamps, and land and freshwater shells.—A. Alletsee, 40 Milward Crescent, Hastings.

WANTED, British land and freshwater shells, in exchange for rare and local South of Ireland plants.—R. A. Phillips, Ashburton, Cork.

OFFERED, Quadrant tandem bicycle and two ladies' bicycles, nearly new. Required, microscope, camera, books, or offers.—W. Kirk, 20 Lombard Street, West Bromwich.

OFFERED, Kirby's "European Butterflies and Moths" (61 coloured plates). Wanted, Newman's "British Butterflies and Moths."—T. Fletcher, 20 Park Road, W. Dulwich.

WANTED, gatherings of living diatoms, either freshwater or marine. Good exchange in mounted diatoms.—I. B. Bessell, F.R.M.S., 8 Elmgrove Road, Cotham, Bristol.

Pandora inæquevalvis in exchange for *Venus sulcata*.—H. Milnes, Winster, Derby.

OFFERED, a collection of fossil shells from Paris Basin, middle and lower tertiary formations. Best offer accepted.—P. R. Shaw, 48 Bidston Road, Birkenhead.

I HAVE a number of bred (perfect) specimens of *A. ricini* (N. American silk-moth), and shall be glad to exchange pairs for other foreign lepidoptera. State exchange.—Mark L. Sykes, 31 Derby Street, Moss Side, Manchester.

WANTED, specimens of recent or fossil echinoderms, star-fish, &c., from any strata or locality. Offered in exchange, fossils, shells, or lepidoptera.—F. Stanley, "Rokeby," Edgar Road, Margate.

WANTED, *Avicula cygnipes*, *Terebratula hasata*, *Ammonites Jurensis*, *Amm. spinatus*, *Amm. planorbis*, *Amm. capricornus*, *Amm. Humphriesianus*, *Stringocephalus*. Any of the following in exchange:—*Ostrea Marshii*, *Calymene Blumenbachii*, *Phacops candatus*, section of ammonite, *Amm. bifrons*, *Holectypus depressus*, *Spirifera plenus*, *Productus semireticulatus*.—P. J. Roberts, 11 Back Ash Street, Bacup.

SIXTY named specimens of New Zealand shells, also thirty different New Zealand and Australian copper tokens. What offers in birds' eggs and nests, or birds' skins.—G. W. Wright, Karanaghape Road, Auckland, N.Z.

DUPLICATES.—*Sphærium ovale*, *S. ovale*, translucent var., *Zonites draparnaldi*, *Helix arbustorum*, var. *canigonensis*. *Planorbis dilatatus*. Desiderata, *Vertigo angustior*, *Vertigo pusilla*, *Succinea oblonga*, *Limnæa involuta*, foreign shells not in collection.—R. Wigglesworth, 13 Arthur Street, Clayton-le-Moors, Accrington.

WANTED, side-blown eggs of heron, razorbill, guillemot, shag, cormorant, gannet, gulls, hawks, larks, warblers, and many others, in exchange for rare duplicates.—Jas. Ellison, Steeton, Keighley.

FOR exchange, beautifully polished specimens of carboniferous limestone and other corals. Wanted, Gault ammonites and chalk fossils, or any good offer in fossils.—W. F. Holroyd, Science Master, Greenfield, near Oldham.

OFFERED, Blackie's "Imperial Bible Dictionary," 6 vols., 9*s*. 6*d*. each, 1886. Wanted, Darwin's works to equal value, or offers.—W. J. Pollard, 22 Fairfield Terrace, Bedminster, Bristol.

WILL any gentleman kindly name some entomological specimens for me?—John A. Ellis, 1 Pomona Place, Fulham, London, S.W.

FOR exchange, a number of long-eared owl's eggs. Wanted, Norfolk plover, nightjar, petrels (leach and fork-tailed), raven, oriole, or any of rarer hawks. Also several clutches of common sandpiper's eggs. Wanted in exchange, dunlins', redshanks', jays', bullfinches'; other offers considered. The eggs are all side-blown, and taken by me here this season.—R. Armstrong, B.A., Thornhill, Dumfriesshire, Scotland.

BOOKS, ETC., RECEIVED FOR NOTICE.

"The Essex Naturalist" (Chelmsford: E. Durrant & Co.)—"The Journal of the Quekett Microscopical Club" (London: Williams & Norgate).—"Natural Science" (London and New York: Macmillan & Co.)—"On the Origin of Elementary Substances, and on Some New Relation of their Atomic Weights," by Henry Wilde, F.R.S. (London: Kegan Paul, Trench, Trübner & Co.)—"Charles Moor, F.G.S., and his Work," by H. H. Windwood, M.A., F.G.S.; with a List of the Fossil Types and described Specimens in the Bath Museum, by Edward Wilson, F.G.S. (Bath: printed at the Herald Office).—"The Microscope" (The Microscopical Publishing Company, Washington).—"Nature Notes" (London: H. Sotheran & Co.)—"The Entomologist" (London: West, Newman & Co.)—"The Annals and Magazine of Natural History" (London: Taylor & Francis).—"The Midland Naturalist" (London: Simpkin, Marshall & Co.)—"The Malden Natural History Gazette" (C. W. Smith, Burlington Road, New Malden).—"Butterfly and Moth Collecting," by G. E. Simms (London: L. Upcott Gill).—"Proceedings of the Bristol Naturalists' Society."—"The Microscope" (The Microscopical Publishing Company).—"The American Monthly Microscopical Journal."—"The Electric Light Popularly Explained," by A. Bromley Holmes (Bemrose & Sons, Limited, London and Derby).—"The Botanical Gazette" (Bloomington, Indiana).—"Daughters of Syria," Quarterly Record (Messrs. Seelsy & Co., Essex Street).—"The British Moss-Flora," by R. Braithwaite (London: 303 Clapham Road), etc., etc.

COMMUNICATIONS RECEIVED UP TO THE 11TH ULT. FROM: F. T.—F. S. M.—G. B.—T. G.—F. R.—Rev. W. W. F.—J. J. R.—J. S. L.—W. J. J., jun.—Dr. P. G. R.—D. E. S.—J. C. H.—P. W.—B. C.—P. L. S.—J. S.—G. W. W.—T. M.—J.—F. S.—C. W. M.—C. P. H.—G. W. C.—F. W. M. S.—E. D.—C. P. M.—J. H. B.—J. E. L.—T. W. W.—T. P.—W. H. B.—W. K.—R. A. P.—J. E. C.—R. W.—T. F.—J. E.—F. S.—W. F. H.—J. A. E.—P. R. S.—A. L.—M. L. S.—P. J. R.—A. C. S.—J. B. B.—J. R. H.—W. J. P.—C. R.—J. A. W.—A. B.—H. M.—T. D. A. C.—A. A.—J. S.—J. B. D.—B. A.—L. W. G.—R. S.—F. B.—Dr. P. Q. K.—etc., etc.

THE COLOURATION OF THE ROSE, THE VIOLET, AND THE BUTTERCUP.

By Dr. P. Q. KEEGAN.

It is proposed here to attempt by certain analyses to discover what is the precise fundamental organic body which determines the colours of the petals of these three flowers. Every botanical student knows that the blue and red colours of flowers are due to dissolved pigments, while the yellows and certain of the oranges depend on solid or crystalline bodies combined with a protoplasmic basis. In order to thoroughly understand what follows, a little knowledge of organic chemistry is absolutely necessary; but I will endeavour to describe the process as briefly and as clearly as possible, so that any student who may happen to enjoy a lucid interval from the more severe collecting (fighting) phases of his beloved science may be able to follow suit. The process certainly "wants a bit o' doing," but after all, it is very simple, provided of course that you know how it's done!

Having gathered some red wild-rose petals on a dry day, you leave them out in the air of your study for forty-eight hours or more, so that they may lose some of their sugar, whereof they contain 3½ per cent. Now cut them up in very small pieces with a common pair of scissors, and place the pieces in a test-tube or beaker, with some strong alcohol. Boil, pour off the liquid and filter, then boil the material again with water, and pour off and filter. The two liquids are mixed and evaporated down in a silver or nickel basin to a small bulk, some strong solution of caustic potash is added, and the whole evaporated to dryness and fused, continuing the heat and stirring occasionally with a glass rod until the mass is in a uniform state of fusion. After cooling, the contents of the basin are dissolved in hot water, and acidulated with sulphuric or hydrochloric acid. After standing and cooling, the liquid is filtered, and shaken up with ether, which extracts and dissolves among others the very substances we are in quest of. Now, what are these? They are no less than three in number, and in this particular instance are rather difficult to detect, inasmuch as the amount of colouring-matter in wild roses is very trifling indeed. However, if we only will brush up our knowledge of organic chemistry, and have sufficient experience, we can recognise here what is called protocatechuic acid, $C_7H_6O_4$, along with two phenols, viz., phloroglucol, $C^6H^6O^3$, and a trace of pyrogallol. But what have these horrid names to do with the bewitchingly beautiful tints of the queen of flowers? I think it can be shown that they have as much, and probably much more, to do with them, than the man in the moon has to do with the ebb and flow of the tides. Not to be too stiffly scientific, I must forbear from entering into details tending to prove that in the case of blue, red, and some other varieties of coloured flowers, it is the tannins, possibly aided by the glucosides, which alone of all the constituents of the petals can possibly be the generating cause of the bright pigments thereof. Now, the aforesaid bodies which we have obtained by virtue of the process just described are the result of the oxidation of the tannin which is proper to the rose-bush itself; and precisely the same bodies can be also obtained by treating the leaves or the stalks or branches of that

shrub in a similar manner. Now, how does it come to pass that under such circumstances it is the petals alone that are tinted, while the other parts are green or brown? Every student of botany is aware that in flowers and inflorescences the chief chemical process which is the expression of their life is called respiration, i.e., oxygen is inhaled and carbonic acid gas given off, the result being that the constituents of the flower are more or less subject to oxidation. In all probability the tannins which metabolise into the pigments, are formed in the cells of the petal itself, wherein they are placed under very favourable circumstances, both physically and chemically, as regards that process of oxidation, to which they are always specially liable. Moreover, the absence of any other pigment (such as chlorophyll, carotin, etc., present in leaves) enables the colouration due to any colour-forming substance whatever existing in the petals to appear in all its native beauty. Certain other constituents of the cell undoubtedly aid and abet in the production of the tints and hues; but the details of the synthesis cannot be mentioned here. But how is it that one kind of flower is red while another is blue? In order to answer this question, we must pass on to the next caravan.

Collecting a small quantity of the flowers of the violet or of the wild hyacinth, we analyse them as before. But here we see immediately that the result of our manipulation is different. Instead of two or three bodies—one acid and two phenols, we now obtain only one body, viz., phloroglucol, which, be it remembered, was also found among the products of our manipulation of the rose. Hence the tints of the latter, being as it were double-based, are much stronger and more vivid than is the case with most other flowers. This phloroglucol is a neutral body; and the point advanced or suggested here is, that in the former case it is combined with an acid, and hence the colour is red, while in the latter case there is no acid, and hence the blue colour is unchanged in its primitive condition. Every petty dabbler in the subject knows that an aqueous decoction of a pure blue petal is instantly turned red by a trace of acid, and on precipitating the acid the blue colour is restored, and this again may be changed to green by the fumes of ammonia proceeding even from a long way off.

Turn we now to the consideration of the brilliant yellow decoration of the buttercup or of the allied marsh-marigold. Here we encounter a state of affairs radically and utterly different. There is little use in this case repeating the process of oxidation now familiar to the reader. By doing so with the strong alcoholic extract of these petals, we get a very small quantity of phloroglucol and maybe an equally minute trace of protocatechuic acid, neither sufficient to account for the splendid vividness of the yellow pigments. What, then, can we do? We must adopt other measures. The colouring-matter is extracted by treating with cold petroleum spirit, or by boiling with strong alcohol or ether, and the fat with which it is mixed is saponified by boiling solution of caustic-soda; the whole is acidified and cooled, then filtered, and the matter on the filter is dissolved in cold alcohol, when the yellow pigment is obtained unaltered by all this rough treatment. This yellow colouring-matter seems to defy oxidation; it is very permanent, and is apparently of the nature of a resin totally insoluble in water. It is not directly related in any way to the tannins or glucosides, and is possibly secreted from the protoplasm itself, like oil-drops or crystals. Like chlorophyll, it is clearly a product of the decomposition of vitally active proteid organic matter, and is evolved only in plants where such largely exists. My investigations have led me to the conclusion that neither of these brilliant pigments are related to the fats or the waxes; they must, therefore, be referred to the terpenes or the resin and camphor group of hydrocarbons. It may be added that their syntheses will never be effected till some chemist not too much engaged in the prosecution of a money-getting patent follows up the study and investigation of the vegetable proteids in a thoroughly systematic and scientific manner.

THE RHIZOME AND ALLIED FORMS.

THE Rhizome or root-stock, which is one of the most universal radical structures throughout both Phanerogamia and Cryptogamia, is in its simpler forms little more than a terrestrial rooting stem. Now if we examine its first modifications, like the stolons of many labiate and rosaceous plants, it will be found to consist simply of a prostrate or ascending rooting stem. But when it becomes enlarged and assumes a subterranean habit, its stem-like structure will be more or less obscured, and become more radical in structure, as those of *Triticum repens*, *Avena elatior*, *Anemone nemorosa*, *Pteris*, *Equisetum*, and many of the species of Carex. etc. In the rhizomes of Nuphar, Iris, Acorus, and the stem tubers of *Helianthus tuberosus* and *Solanum tuberosum*, the stem structure is still less prominent, although plain enough.

When the rhizome assumes an erect or vertical position, as in those of *Tamus communis*, *Bryonia dioica*, Discorea, etc., its primordial type is very indistinct; but in the bulbs, and the erect rhizome of *Cicuta virosa*, the stem structure is still obvious: while in the stem tubers of Bunium, Conopodium, and the tubercules of many orchids, this relation is almost obliterated. The structural analogy of the stem is usually prominent in the root-stock, but less so in the corm. The corms of *Arum maculatum* well illustrate their analogy to the rhizome; they are, in fact, a rhizome like that of Iris, whose extremity (the terminal bud) is annually elongating, while its other end is con-

tinually decaying. These corms frequently produce lateral smaller corms in the axils of the leaf-scales, like the "eyes" of potatoes. A very brief and precise description of the development of the corm is that of Henfrey, which is as follows:—"The corm of *Arum maculatum*, examined in spring, exhibits two lobes, with an intermediate constriction; they lie adjoined horizontally: the corm of the past year is shrivelled; the other is solid and at the summit exhibits sheathing scales enveloping the base of the erect flowering-stem. Opening the sheath, which turns upwards, we see that the flower arises from a terminal bud, while in the axil of the leaf arising below it, exists a bud which is destined to swell up and form a new corm for the next season, the oldest one meantime withering away; so that two generations with the rudiments of the third always co-exist; these generations may consist of a greater number of individuals when additional corms arise from the axils of several of the scales of the parent corm." I may add that by carefully lifting these corms from the earth the shrivelled remains of several corms of preceding years may be found, if this is performed with great care.

HENRY E. GRISET.

NOTES ON THE PARASITIC TENDENCY OF ROTIFERS OF THE GENUS PROALES; WITH AN ACCOUNT OF A NEW SPECIES.

By PERCY G. THOMPSON.

NO more interesting facts are known in connection with any particular class of animals than those having reference to the structure and habits of the parasitic members which it includes.

In the Rotifera, some species are permanently and exclusively parasitic in or upon other organisms, animal or vegetable, and present consequent modifications of structure often of great significance; while again, not a few forms assume a semi-parasitism for mere temporary purposes of transport or alimentation, and these, as might be expected, exhibit no very remarkable structural peculiarities. It is the object of the present paper to present a few new examples of this latter *occasional* parasitism.

The genus Proales contains rotifers, some of which have been long noted for the strangeness of habitat and mode of life which they have chosen, in which to play their part in the universal struggle for existence. Thus *P. parasita* has been recognised as an inmate of the revolving spheres of *Volvox globator* ever since the time of Ehrenberg, taking up its abode permanently and depositing its eggs in security within the crystal plant-globes. And *P. Werneckii* has been known for an equally long period as characteristically inhabiting certain gall-like outgrowths upon the stems of various species of Vaucheria. These two are well-known instances of the tendency to parasitism in this genus; I wish now to mention certain others.

Ehrenberg has stated that a sister-species of Proales, *P. petromyzon*, occasionally occurs with *parasita* in the Volvox spheres; this has never, to my knowledge, been confirmed by any subsequent observer, but is rendered all the more probable from the fact that I have myself seen a third species of this genus, *P. decipiens*, present within this alga. In the latter case, adults and their deposited ova were present together within the Volvox, and the Proales appeared fully at home, nor did the spheres present any appearance of being torn by forcible intrusion of the rotifer; no specimens of *P. parasita* were present in any of the globes at the time.

This same species (*P. decipiens*) I have seen also, on one occasion, cosily ensconced within the partly-decayed filaments of Vaucheria, thus usurping the place of its ally, *P. Werneckii.* The Vaucheria thread contained so many developing ova (more than a score) as to suggest that quite a series of adults had been in the habit of frequenting it, while some half-dozen individuals of *decipiens*, not long escaped from the egg, roamed along the tube, poking about for a way of exit. No galls were formed upon the alga such as are produced by *P. Werneckii*, the rotifers and ova merely occupying an ordinary filament, which had probably begun to decay before the former entered into possession.

The fact is that *P. decipiens* is eminently of a grubbing disposition, making its way into any hole or corner where decomposing matter—whether of animal or vegetable origin does not seem to be of consequence—is present, and there taking up its abode for a longer or shorter while, until this rich store of food-material is exhausted. I have thus repeatedly seen it in situations where such decomposition has been in progress, sometimes cleaning-out the shell of a dead water-flea, or again in an alga-cell, in each case evidently with the same object in view. Once I came across what I suspect to have been this species, curled up inside the test of a living rhizopod (*Nebela collaris*), in some sphagnum-water. How the rotifer had effected its entrance was a puzzle, for the Nebela's sarcode filled up the mouth of the shell like a plug, leaving a large space within the fundus in which the Proales lay, alive but inert; that the rhizopod was also living was proved by slight movements of the protoplasm. Of course, the rotifer may have been but the victim of the Nebela, and have been engulfed as food—perhaps after a desperate struggle for its life, succeeding in forcing its way clear of the deadly living jelly into the cavity of its assailant's shell; but it is just as likely that the rhizopod was the aggrieved party and the victim of unlawful entry on the Proales' part. Other Nebela shells were seen with rotifer ova within them.

Proales petromyzon, although usually met with freely swimming, I have noticed playing the part of

an epizoic parasite upon *Daphnia pulex* and other aquatic animals. In a gathering from a pond near Woodford, in Epping Forest, nearly every individual of this cladoceran was attended by one, or several, of these rotifers, the latter evidently in more or less permanent quarters, with their deposited ova beside them, upon the Daphnia's shell. The cause of the Proales' presence was not difficult to determine in this case, for the water-fleas were all more or less thickly infested with clusters of small epistylids, upon which some of the rotifers were observed to feed, leisurely moving along and nibbling with their trophi at the infusorians one after another, each of the latter wholly disappearing in a few seconds. Not only upon *Daphnia pulex* did specimens of this rotifer occur; upon search being made several larvæ of the May-fly, and also a single *Cyclops serrulatus*, were found to be likewise encumbered with them, colonies of infusoria being present in each case; curiously enough, not a single individual of *Simocephalus vetulus* examined (and there were not a few in the water) bore either rotifers or infusorians. The rotifers' eggs were attached to the host's carapace by a drawn-out thread of hardened mucus. Upon one Daphnia, a Proales had taken up its quarters right in the very midst of a thick cluster of Epistylis; seeing also that three of its ova lay beside it, developing, the fate of the unconscious infusorians in the near future appeared by no means uncertain. In such manner did this rotifer, for the nonce, enter into commensal partnership with the water-fleas and insect larvæ, gradually freeing them from their swarms of adherents in return for its transit and food; as, however, the Daphnias could have very easily cleared themselves of the annoying hosts at their next moult, it follows that the Proales' services scarcely compensated for the extra fatigue in carrying these bulky rotifers about.

In concluding this paper, as a further illustration of the quasi-parasitic habit of Proales, I have to bring forward a species which seems to fall within the limits of this genus, and which is certainly an undescribed form. I propose to give this the name of

Proales daphnicola.

In the latter part of October of last year, on two occasions, a pond at Leytonstone, Essex, was found to be swarming with numbers of fine red *Daphnia pulex;* upon many of these occurred, roaming about over the carapace, examples of an illoricate rotiferon which at once struck me as unfamiliar. Eggs were also present attached to the cladoceran's shell, just as in the similar case of *P. petromyzon* already noticed; and, as with that species, the rotifer could leave the Daphnia at will, and swim freely. A few notes and a rough sketch of the creature were taken, and its internal anatomy found to present nothing worthy of special remark, the particulars secured being detailed below. I have not since seen further examples of this form either in subsequent dips from the same pond or elsewhere; the swarms of Daphnias rapidly decreased with the advent of cold weather, and very soon not a specimen was to be taken from the pond. I am constrained therefore to give an account of this creature now, notwithstanding the paucity of particulars, in the hope that others, or I myself, may come across specimens in the ensuing autumn, and fill up any blanks in the present description.

The form is fairly plump, thinning behind without abrupt distinction between the body and foot. The coronal face is obliquely truncate, abundantly ciliated. I saw no frontal proboscis. The mastax of

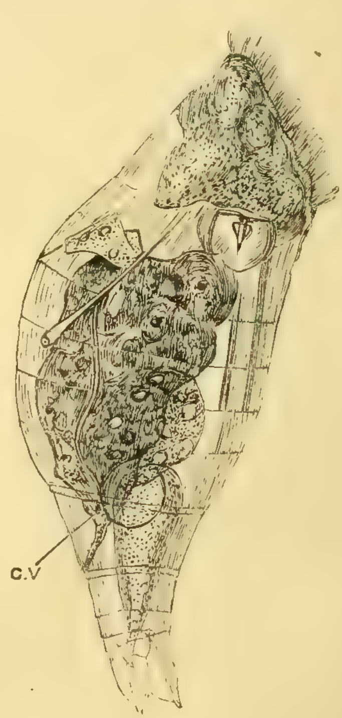


Fig. 125.—Parasitic Rotifer (*Proales daphnicola, n. sp.*), slightly compressed.

moderate size, the contained trophi of the usual notommatous type. Gastric glands rather large, angular. Ovary small. Brain a clear transparent sac of but moderate length, no trace of an eye being visible. Dorsal antenna not discerned, but the lateral antennæ were distinct when the animal was under compression, placed about half way down the body upon the dorso-lateral surfaces, and each connected with a nerve-thread running up towards the front of the body. Lateral canals and their tags were present, also a moderate contractile bladder below the intestine. The muscular system, so far as observed, is

quite normal; several longitudinal "head-retractor" bands run through the body, and some five transverse cords encircle the trunk at equal intervals. The foot-glands are a pair of remarkably long, club-shaped, turgid organs, extending from the toes right up into the trunk, to the level of the summit of the contractile vesicle; their ducts plainly open as projecting tubules at the extremities of the large swollen toes. These latter are of peculiar and distinctive shape (see fig. 125) and will, I think, with their nipple-like ducts, sufficiently identify the species; the foot, of some four joints, is short, and in width not more than one-third the greatest width of the trunk.

This creature bears a certain resemblance, in its long foot-glands, and in the shape of the gastric glands and toes, to a form described by Dr. Plate as parasitic on Gammarus, under the name of *Furcularia gammari*, but is evidently not identical therewith.

Length, about $\frac{1}{96}$ inch.

Sp. Chars:—Body plump; eye absent; gastric glands angular; foot glands remarkably long, turgid; foot short; toes short, thick, swollen cones, with projecting duct-orifices.

POND LIFE STUDIES.

No. I.—Cyclops quadricornis.

By H. Durrant.

In this and the following papers I shall try to give some idea of a few of our commonest and smallest pond inhabitants. I select the commonest because they are easily obtainable by those who have little time at their disposal for collecting, so that they will be able to procure them without trouble, and thus follow me in my remarks with the living animal before them. What I wish to do is to give as thorough and comprehensive a description of each one as possible and to indicate some of the more important habits connected with their life-history. My notes and diaries will be called into account here, together with original drawings from life of the various ones under consideration.

The subject of my first paper, as will be seen above, is the common Cyclops, a creature familiar to all microscopists, and indeed it is scarcely possible to take a dip in any pool, clear or otherwise, without taking a few. But let us see its position in the animal world. Cyclops is a genus of the Branchiopoda, the latter being the first order of the division Entomostraca of the class Crustacea. It is distinguishable as follows:—The thorax is segmented. There is only a single eye, and that central, and placed on the anterior and largest segment. Body gelatinous, rather oval, divided into an anterior and a posterior portion. The first contains head and thorax; the latter the forked tail. The anterior portion of the body consists of four segments, of which the first takes up about two thirds, and includes a portion of the thorax. These are covered by a scale common to both. On the frontal part are situated the solitary eye, the four antennæ (two superior and two inferior), two mandibles furnished with either a simple or branched feeler, two jaws (external mandibles of Jarine), and four feet, each divided into two cylindrical stems, either fringed with hair or bearded. Jarine compares the anterior pair to a kind of hand. The three remaining segments each give rise to a pair of legs. The two superior antennæ are the longest. They are articulated, setaceous and simple. In the males these antennæ are frequently contracted in places with swellings between. The antennules (lower antennæ) are filiform and

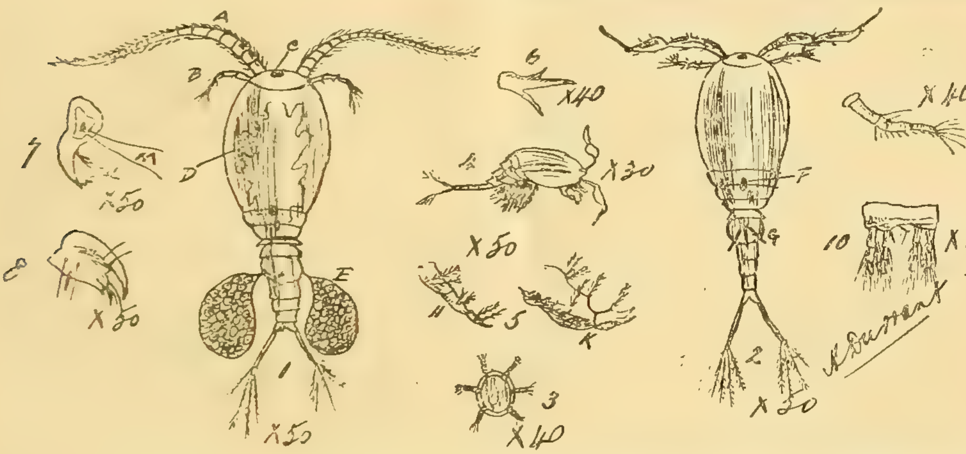


Fig. 126.—*Cyclops quadricornis.* 1, female *C. quadricornis:* A, superior antennæ; B, inferior ditto; C, eye; D, internal ovaries; E, external ovaries. 2, male, *C. quadricornis,* var. *rubens:* F, heart; G, male organs. 3, young, recently hatched. 4, male of type. 5, second pair of foot-jaws: H, external portion; K, internal portion. 6, rudimentary legs. 7, mandible: L, serrated seta; M, palp-filaments. 8, first pair of foot-jaws. 9, Inferior antennæ of male. 10, thoracic legs, ditto. N.B.—The figures of enlargement are not mathematically correct, but near enough to serve the purpose.

generally composed of four joints. Either simple or forked. The posterior portion or tail is generally counted from the segment preceding the sexual organs, which in the female has two small feet (*fulcra*, Jarine). It is not, however always to be clearly distinguished from the thorax, but it consists of six segments. In the males the second segment is provided with articulated processes of variable shapes, relegated to play the part of organs of generation. The female organs are also placed on the second segment. The sixth segment is terminated by two lengthened appendages forming a kind of fork, fringed with extremely fine hairs.

Specific, *Cyclops quadricornis*, Müller; *Cyclops vulgaris*, Leach; *Monoculus quadricornis*, Linn. Abdomen (apparently the tail) composed of six, sometimes seven segments. Last segment separated at end into two lobes. Superior antennæ composed of a large number of joints (about twenty-eight); setæ arising from each one. In the male there is a distinct swelling near the middle, followed by a constriction, and a kind of hinge. Antennules largish; segments four, each one with setæ, the last one with six. About one-third length of superior antennæ. Mandibles consist of an oval body terminated with a number of teeth of a brownish colour and a single serrated seta. There is also present a palpus of one segment and two filaments. First pair of foot-jaws each consist of a convex externally and concave internally, body with several strong teeth and a single jointed palpus or rather palp-like process, with setæ. Second pair of foot-jaws divided into two portions:—an external with four joints and an internal with three. Five pairs of branchial legs arise from the thoracic segments, but the fifth pair are only rudimentary; in the male they are three jointed, in the female two jointed. Tail two-lobed, each lobe terminated by four setigerous filaments, of which the two intermediate ones are the longest. Heart nearly oval, situated under second and third segments of body. It gives off two branches: one to the head, the other to the tail. Below is another organ, also giving off two vessels. Perhaps analogous to the branchiocardiac canals of the decapodous Crustacea. Alimentary canal extending the whole length of body.

Life-history.—Frequently it will be noticed that on each side of the female is a balloon-shaped sac filled with eggs. These structures are the external oviparous pouches or ovaries, and in reality are only continuations of the internal sac, with which they communicate by a minute canal. This fine canal joins the body at the second segment near its junction with the third. At an early stage the eggs are brownish, afterwards gaining a reddish orange colour. The generating power is very great, and one fecundation is sufficient for many generations. Add to this the fact that the female can deposit eggs ten or twelve times per month, and some idea of the amount of descendants from a single pair of Cyclops will be obtained. Some writer has computed that one female may be the progenitress of four thousand, five hundred millions, allowing eight ovi-positions of forty eggs to each. The young are extremely unlike the adult animal, as a reference to the illustration will show. At their birth they have only four feet, and their body is without the vestige of a tail.* About twelve days afterwards they acquire another pair of feet (†). After this they undergo their first moult, which transforms them to the adult; but the feet, antennæ, etc., are not even yet perfectly grown. One or two more moults however, and they are at last fully formed and fit for the reproduction of their species. As regards their food, they prefer animal matter but do not scruple, under adverse circumstances, to regale themselves on vegetable.

Varieties.—Among these are the following:—*Rubens:* Reddish in colour, sometimes inclining to orange; eggs brownish, forming oblique masses at the sides of the tail; length eight-twelfths of a line. *Viridis:* Green or greenish; egg masses suspended in a direction a little higher up than the former; length, nine-twelfths of a line. *Fuscus:* brownish red; nearly oval; egg masses partly covering tail; length, six-twelfths of a line. *Albidus:* greyish white, tinged with brown. Egg masses greenish, suspended at nearly a right angle with tail; length, eight-twelfths of a line. *Prasinus:* deeper in colour than *viridis*. Eggs greenish, turning to faint rose colour when about to be hatched; in two masses seemingly incorporated with the tail; length, six or seven-twelfths of a line.

To these I must add descriptions of two more which came under my notice some time ago, viz.:—A variety in which the segments of the abdomen are shorter, appearing as if they had been "telescoped." On a first glance it looks as though the abdomen had been cut off in part. Length about six-twelfths of a line. Colour brownish. I would propose that the name *truncatula* be applied to this form. The second variety is of the colour of *fuscus* (Jarine), but more elongated, and the egg masses do not overlap the tail to so great an extent. The antennæ are also finer. Length about seven-twelfths of a line. Neither of these two varieties has, to my knowledge, been described before. At the time I came across them I was not so interested in the species, and consequently my descriptions of them were not very minute. I am, however, looking out for more specimens, so as to put on record a better and more complete description. In the meantime some of my readers may perhaps come across them. I shall be glad to receive species for identification at my address as under: 4 Boulton Road, West Bromwich, Staffs.

* Müller represented them as the genus Amyone at this stage; and the genus Nauplius at this †.

SPECIES, VARIETIES, ETC., DESCRIBED OR OBSERVED IN GREAT BRITAIN AND IRELAND SINCE THE PUBLICATION OF BABINGTON'S MANUAL, ED. 8 (1881), AND HOOKER'S STUDENT'S FLORA, ED. 3 (1884).

By Arthur Bennett, F.L.S.

London Catalogue, Ed. 8.

No. 2.

POTAMOGETON VARIANS, Moung, in litt. et herb! A. Fryer, Journal of Botany, pp. 33–6, 1889. Small, like thin leaved forms of *heterophyllus*.

Potamogeton falcatus. Fryer, Journal of Botany, 1889, p. 65–7. Cambridgeshire. Allied to *nitens* and *heterophyllus;* differs from latter in clasping leaves, from former in fruiting freely, etc.

Potamogeton heterophyllus (*sub-gramineus*) var. *graminifolius*, Fries. Fryer, Journal of Botany, 1892, p. 33. Long, sub-parallel-leaved form of type.

Potamogeton nitens, var. *salicifolius*, Fr. Argyle, etc. C. Bailey, Journal of Botany, 1887, p. 88.

Potamogeton nitens, var. *curvifolius* (Hartm.). Ex. Club Report, 1888, p. 235. Killarney, Ireland. N. W. Scully. Narrow recurved-leaved form.

Potamogeton undulatus, Wolfg. A. Fryer, Journal of Botany, 1891, p. 289. "*P. crispus* x *perfoliatus.*" Stem of *crispus*, leaves (mature) more like *perfoliatus*, etc.

Sparganium neglectum, Beeby. Beeby, Journal of Botany, 1885, p. 26. Habit of *ramosum*, but fruit like *simplex*. Many counties of mid. and south England.

Sparganium ramosum, var. *microcarpum*, Neuman. Ex. Club Report, 1888, p. 234, Beeby. Isle of Wight. Liable to be named *neglectum*, but belongs to *ramosum*.

Sparganium simplex, var. *longissimus*, Fr. Beeby, Scot. Nat. Shetland. A floating form of *simplex*.

Juncus alpinus, Vill. Sutherland, Perth. B. White, Scot. Nat., 1887–88, pp. 182–4. Like small *lampocarpus*, but fruit more rounded, etc.

Luzula maxima, DC., var. *gracilis*, Rostup. Beeby, Scot. Nat., 1887, p. 29. Foula, Shetland.

Schœnus nigricans, var. *nana*, Lange. Shetland. Beeby, Scot. Nat., 1887–88, p. 27. Caithness. Marshall. Small, condensed form of the type.

Schœnus ferrugineus, L. Perth. B. White, Journal of Botany, 1885, p. 220. Mr. Brebner. More slender than the last, fewer flowered.

Scirpus (*Eleocharis*) *acicularis*, var. *longicaulis*, H. C. Watson. Clarke, Journal of Botany, 1887, p. 270. Yorkshire. Tall form, slender, etc.

Scirpus sylvaticus, var. *dissitiflorus*, Sond. Perth. B. White, Scot. Nat., 1885–86. Many of the flowers pedicelled, etc.

Scirpus maritimus, var. *conglobatus*, Gray. Ross. Druce, Journal of Botany, 1890, p. 44. The compact spiked form.

Carex disticha, var. *longibracteata*, Schleich. Oxford. Druce, Journal of Botany, 1890, p. 231.

Carex vulpina, var. *decomposita*, var. *aristata*, and var. *acuta*, all of Gray (1821). Oxford. Druce, Journal of Botany, 1890, p. 231. These are rather states, than varieties.

Carex helvola, Blytt. Lochnagar, Journal of Botany, 1886, p. 149. Arth. Bennett.

Carex rigida, var. *infuscata*, Drej. Forfar.

Carex rigida, var. *inferalpina*, Laest. Forfar. The latter a tall long-spiked form that perhaps will be better referred to *C. limula*, Fr.

Carex Goodenovi, var. *juncella*, Fr. Arth. Bennett, Journal of Botany, 1885, p. 50, Surrey! Lincoln! Warwick! Isle of Skye, etc. A narrow-leaved, tufted form with slender spikes.

Carex Goodenovi, var. *melæna*. Journal of Botany, 1890, p. 44.

Carex Goodwini, var. *curvata*. Druce, Journal of Botany, 1890, p. 44. Inverness.

Carex acuta, L., var. *gracilescens*, Almq. Arth. Bennett, Journal of Botany, 1885, p. 50. Salop! Cambs.!

Carex elytroides, Fr. Arth. Bennett, Journal of Botany, 1889, p. 117. Anglesea. Slender with dark glumes, fruit with small asperities.

Carex cæspitosa, L. (Fr.) Beeby, Scot. Nat., 1887–88, p. 184. Shetland. Compact growth, without creeping shoots, fruits nearly nerveless, etc.

Carex aquatilis, Wahl., var. *cuspidata*, Laest. Caithness. F. J. Hanbury, Journal of Botany, 1886, p. 95. With long cuspidate glumes.

Var. *epigejos*, Laest. Perth. Slender, dark-coloured.

Var. *virescens*, Anderss. Perth. B. White, Scot. Nat., 1885–86. Glumes very short.

Carex stricta, Gont., var. *turfosa*, Fr. (sp.). Arth. Bennett, 1885, p. 50. Camb.!

Carex salina, var. *kattegatenses*, Fries (sp.). Arth. Bennett, Journal of Botany, 1885, p. 50. Caithness! Druce, Journal of Botany. East Inverness.

Carex spiralis, Ewing in Trans. Nat. Soc. of Glasgow, p. 110, 1887. Near the ridge between Forfar and Aberdeen, P. Ewing! A form of *C. rigida*, Gud.

Carex capillaris, var. *alpestris*, Anderss. Perth. P. Ewing, Trans. N. H. Soc. of Glasgow, p. 113 (1887).

Carex binervis, Sm., f. *nigrescens*. Druce, Journal of Botany, 1890, p. 44.

Carex vaginata, Tausch., var. *borealis*, Anderss., *sub-sparsifolia*. Ewing, Trans. N. H. Soc. of Glasgow, p. 113, 1887.

Carex pilulifera, L., var. *adusta*, F. A. Lees. Rep. Record Club, 1885, p. 52.

Carex pilulifera, f. *reptans*, Lange. Shetland. Beeby, Scot. Nat., 1887–88, p. 217.

Carex pallescens, L., var. *undulata*, Kunze. Ewing, Trans. Nat. Hist. Soc. Glasgow, p. 113, 1887. Merely a crimped bracted form.

Carex lævigata, var. *gracilis*. Arth. Bennett, Journal of Botany, 1889, p. 314. Salop. Fruit nearly patent, spikes slender, aspect of *C. punctata*, Gaud.

Carex intermedia, Miégville. Near Fort William, Inverness. Marshall, Journal of Botany, 1889, p. 235, Habit of *panicea*, but also like *vaginata*, betweeu the two.

Carex Œderi, var. *œdocarpa*, Anderss. Druce, Scot. Nat., 1887–88, p. 330. Inverness.

Carex (*ampullacea*) *rostrata*, var. *maxima*, var. *pendulina*. Ex. Club Report, 1885, p. 139. Surrey.

Carex vesicaria, var. *diochroa*, Anderss. Arth. Bennett, Journal of Botany, 1885, p. 51. Ben Lawers.

Carex extensa, var. *pumila*. Ex. Club Report, 1887, p. 193. Holyhead. J. E. Griffith.

Carex panicea, var. *conferta*, Nillson. Carnarvon. J. E. Griffith, Ex. Club Report, 1887, p. 193.

Anthoxanthemum odoratum, var. *pubescens*, Gray. Ireland. Druce, Journal of Botany, 1891, p. 306.

Agrostis canina, f. *grandiflora*, Hackel. Ross, Aberdeen, Inverness. Scot. Nat., 1887–1888, p. 330.

Agrostis canina, var. *Scotica*, Hackel. W. Ross. G. C. Druce, Scot. Nat., 1890, p. 239. An intermediate form between *canina* and *A. rubra*, L.

Agrostis alba, var. *coarctata*, Hoffm. W. Ross. Druce, Scot. Nat., 1887–88, p. 330.

Agrostis alba, var. *gigantea*, Roth. Lancashire, Holt.

Agrostis alba, var. *subjungens*, Hackel. Arth. Bennett, Journal of Botany, 1887, p. 84. Lancashire.

Calamagrostis borealis, Laest. Perth. Druce, Journal of Botany, 1889, p. 117.

Calamagrostis strigosa, Hartm. Arth. Bennett, Journal of Botany, 1885, p. 253. Caithness. Very like *C. stricta*, but glumes and hairs longer, leaves, etc., more flaccid, etc.

Deschampsia cæspitosa, var. *argentea*, Gray. Oxford. Druce, Journal of Botany, 1890, p. 233.

Deschampsia cæspitosa, var. *pallida*.

Bumus mollis, var. *interruptus*. Druce, ex. Club Report, 1888, p. 240.

Trisetum pratense, var. *variegatum*, Gaud. Ireland. Druce, Journal of Botany, 1891, p. 306.

Trisetum pratense, var. *lutescens*, Druce, l.c.

Glyceria distans, var. *prostrata*, Beeby. Beeby, Scot. Nat., 1889, p. 38. Shetland. Small, quite "hugs" the ground.

Glyceria fluitans, var. *triticea*, Fr. Sutherland. Marshall, Journal of Botany, 1891, p. 117.

Glyceria plicata, var. *depauperata*, Crepin. Druce, Journal of Botany, 1890, p. 233. Oxford.

Poa palustris, L. Perth. B. White, Journal of Botany, 1889, p. 273.

Poa annua, var. *supina*, Gaud. Ireland, Mid. Perth. Marshall, 1888.

Poa alpina, var. *lapponum*, Laestad.

Poa alpina, var. *alpestris*, Anderss. Ewing, Trans. Nat. Hist. Soc. of Glasgow, 1887, p. 114.

Poa trivialis, var. *glabra*, Doell. Ex. Club Report, 1888, p. 229.

Molinia cærulea, var. *minima*. Journal of Botany, 1887, p. 169, and 1888, p. 155.

Catabrosa aquatica, f. *grandiflora*, Hackel. Caithness. Hanbury and Marshall, Journal of Botany, 1887, p. 169. Prostrate, flowers very large.

Dactylis glomerata, var. *congesta*, G. et G. Great Ormes Head, Wales. A small abbreviated form.

Festuca rubra, var. *pruinosa*, Hachel.

Festuca rubra, var. *lanaguinosa*, M. et R. Elgin. Druce, Journal of Botany, 1890, p. 46.

Festuca heterophylla, Lam. Surrey. Marshall, Journal of Botany, 1889, pp. 94, 249. Oxford. Hants. Root leaves triangular, 12 inches long, scabrid, tall, 2 to 4 feet, etc.

Festuca sciuroides, var. *intermedia*, Hackel. Surrey. Arth. Bennett, Journal of Botany, 1887, p. 84. Form connecting *sciuroides* with *F. Myuros*, L.

Brachypodium pinnatum, var. *cæspitosum*, R. et S., var. *cornutum*, Reichb. Oxford. Druce, Journal of Botany, 1890, p. 233.

Agropyrum repens, var. *Vaillantum*, Reichb. Oxford. Druce, Journal of Botany, 1889, p. 201.

Agropyrum repens, var. *dumetorum*, Reichb. Oxford. Journal of Botany, 1890, p. 47.

Lycopodium selago, var. *recurvum*, Desv. Ross. Journal of Botany, 1890, p. 47.

Isoetes lacustris, var. *falcata*, "Lange" (but the var. is of Tausch). Shetland. Beely, Scot. Nat., 1889, p. 39.

Equisetum sylvaticum, var. *capillare*, Hoffm. Elgin. Marshall, Journal of Botany, 1887, p. 169. Aberdeen. Inverness. Surrey, Sussex. A very slender form with very fine branches and bright green.

Equisetum arvense, L., var. *nemorosum*, Braun. Oxford. Druce, Journal of Botany, 1890, p. 234.

Lengthy as this list is, it might be greatly extended if Rubus, Salix and Hieracia, with hybrids, sub-var., etc., had been included. I ought here to say that I do not hold myself responsible for any names that are not mentioned under my name; I take them as I find them.

Ranunculus cambricus, Ar. Benn. Since the above was named, I have submitted specimens of the plant to H. Freyn, the well-known authority on the genus, and he has named it "*R. carniatus*, Schur?." For ten years I have had it growing, and watched it at all seasons; and while fully believing it is a nov. sp., and not the plant of Schur, still, in deference to Herr Freyn's authority, I leave it at present under the name he suggests, intending to submit to him a larger series next winter.

OBSERVATIONS ON PRIMULACEÆ.

IN writing my notes taken on diseases and anomalies of two of our commonest spring plants, *Primula vulgaris* and *P. veris*, to readers of SCIENCE-GOSSIP, I must say that what I have written is not to be taken as an argument on any point connected therewith, but merely as a slight aid to those who know more about the subject than I do, and who may be able to follow up such remarks towards a much more certain verification than I could possibly do.

I find it much more convenient for me to notice my several parts somewhat separately, instead of in a general way, as most of the papers in connection with this paper do, hoping I may be excused on that ground, that it may be more lucid than if I had otherwise written it.

I will consider the diseases of *P. vulgaris* and *P. veris* first of all. Besides the notes taken this year on this subject, I add a few others taken before.

The diseases of this family generally do not seem to be many, but two special kinds belong to the above two flowers, the fungous and the insect one.

The first is like white masses of matter of the nature of a sponge, through the lens, found in the tube of corollary, and affecting stamens entirely, and sometimes the pistil, rarely the tube of corolla itself. What the result is on the flowers themselves I cannot say, whether it has the effect of preventing fertilization, and of keeping all kinds of insects away, I do not know, but I have never seen any insects of any kind near such flowers, although to look at they have been perfectly healthy in almost every external particular. I believe that plants growing in damp woods with running streams near are much more widely affected by it than those growing in open fields or in sandy or limestone (mainly) soil.

Of the plants *P. vulgaris* and *P. veris*, the former is much more liable to it than the latter, as may be shown from the following numbers—that out of one hundred flowers *P. vulgaris* had about sixty attacked, while *Primula veris* had only about thirty-four. However, the disease is comparatively small in proportion to the number of flowers examined by me. Thrum-eyed and pin-eyed flowers in each case were very equally subject to it.

The notes I made before in an earlier number of SCIENCE-GOSSIP, saying that, "if one flower or plant was diseased, all were," I must refute; although at that time what I said was correct, on further investigation I find it does not hold so good; but if there are two sides to the question, I would still maintain that, as a general rule, it will be found to be the case, perhaps when examined more for a few years longer.

Passing on to the second cause of disease, that of insects, there is a larger proportion of flowers injured by them than by the fungus. And there are three special insects that seem to take up their home in these plants for certain. Not being much of an entomologist I do not know their names, so I must just describe them briefly with drawings.

1. Length about $\frac{1}{10}$ inch. Brown in colour on abdomen and head and upper part of thorax, and whitish on lower part of thorax. Head and thorax seem to be separate (?) Abdomen is pointed at end. Legs three pairs. Antennæ very long (Fig. 128).

2. Large and black in colour: $\frac{1}{8}$ inch long about, or rather more perhaps. Legs brown. Shining on back. This insect is larger than the above in every way, and has a bony skin (Fig. 129).

3. Reddish-brown in colour, and whitish or light

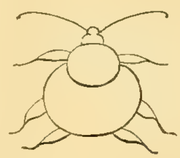


Fig. 127.

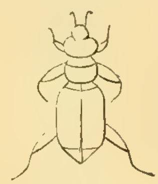


Fig 128.

Fig. 129.

Fig. 130.

Fig. 131.

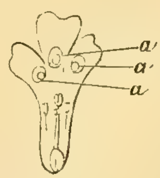


Fig. 132.

in colour on the under side. Shiny also, and bony to look at, and shape as in Fig. 127.

The above three insects predominate by far among these two plants, and seem peculiar to them.

The disease must be due more especially to the first of these insects, as in many instances where I found the disease I most often found the first kind by a long way.

The nature of disease was brown in colour and dark-reddish in some parts, and under the lens like masses of legless grubs. Some people may think it was the eggs of the insects I have been mistaking for the disease; but I do not think they were, although I found in about three-quarters of the flowers examined, that both the first two kinds of insects

always went in pairs, sometimes there being only one pair in tube of corolla, at other times five or six pairs, while the third kind was of a more solitary nature, going alone.

Out of two hundred plants examined (this is an average) forty-two flowers of *P. vulgaris* had insects in them, while in *P. veris* only twenty had, and the flowers were found much in the same districts as in the other disease I spoke of.

Only in one case in each did I find a worm, which was of a greyish-green colour, with a black head, out of all I examined during the season.

My sketch about the above has been so poor, and my remarks very uninteresting, I am afraid, that what I have to say on anomalies will be but brief and just as I found them, with but few remarks on them, as in some cases I think explanation is needed from others, by others better acquainted with them than myself.

The following is a list of anomalies found, or at least the main ones :—

P. vulgaris, pin-eyed ; one stamen was developing itself into a petal.

P. vulgaris, pin-eyed ; in tube of corolla the stamens were smaller than usual, being only ⅓ or ½ size of stamens of this family generally, and the anthers were white, and no pollen on them. The flower in appearance was about ⅝ inch in diameter, and apparently very healthy.

P. vulgaris, pin-eyed ; a style branched into two from pistil (Fig. 131), also stigma was wanting, and what appeared like a stigma was a flattening and swelling of the style (Fig. 130).

P. vulgaris, thrum-eyed ; two similar malformations.

P. veris, two thrum-eyed ; no stigmas, and one with no stamens.

P. veris, thrum-eyed ; in two flowerets, on head of five or six ; the number of stamens was six.

P. vulgaris, pin-eyed ; four petals only.

P. veris, having five flowerets ; two were thrum-eyed ; three pin-eyed. The pin-eyed were not diseased, the thrum-eyed were.

P. veris, thrum-eyed. This flower was one of the most extraordinary I ever came across ; it had six sepals, eight petals, nine stamens, and style and stigma very short. No other flowers on the same plant were deformed, and there were about six more. In this same flower one of the stamens was formed abnormally ; it had first of all a piece of the tube raised and curled, as it were, into a stem, and then from this stem it had itself grown out. I could not draw it on paper plain enough to be understood, or I would do so.

P. vulgaris, thrum-eyed. I noticed what appeared to be a secondary growth out of each of its petals of the same colour as the petals, Fig. 132, *a*, *a*, *a*.

Very often I have found no stigmas or styles or stamens at all in both.

P. vulgaris, pin-eyed ; five sepals, six petals, six stamens.

P. vulgaris, with all its parts in sixes.

P. vulgaris, thrum-eyed ; four stamens, ditto none.

P. vulgaris, pin-eyed ; four stamens.

These are the principal out of a large number noted ; there were several minor points which I thought not worth mentioning in this paper, but I hope that others may be persuaded to carry on these investigations, and to tell us more next year about this subject.

My haunts for investigating the above flowers were in the counties of Yorkshire, Cheshire, Shropshire, Co. Down and Antrim (Ireland), and in different districts in these counties, and not confined to one part in particular. The only remark I have to make is that not any *P. veris* were got in Ireland at all.

J. H. Barbour.

THE SHELLS OF STOURPORT.

By Joseph W. Williams.

STOURPORT is a small town, of some four thousand inhabitants, situate in Worcestershire, four miles from Kidderminster and twelve from the county capital. The vicinage is picturesque and chiefly of the true rural type, well-wooded and well-watered ; the geological formation is largely that of the New Red Sandstone, which rises into wooded heights in every direction ; the rivers are the Severn and the Stour, while of still water may be mentioned, among many others, Hillditch Pool, Stinton Pool, Rush Pool, Bishop's Pool, Wildon Pool, and the Staffordshire and Worcestershire Canal, with its several basins in the town. Few, if any, conchologists visit the locality and it was practically unworked until I gave it my attention ; I hope, however, that the publication of this list will be the means of bringing its richness to the notice of any workers who may be within a sufficient distance to give Stourport and its vicinity the attention it evidently deserves, and thus do much towards rendering our knowledge of its molluscan fauna more complete than my limited time has permitted me to accomplish. My visits have been once a year, averaging about a month in each summer, and it is only during the past four years that I have given any attention to the conchology of the locality and that more or less intermittingly. The list below is taken from my notes extending over those years. I, however, published a preliminary list in the "Journal of Conchology" (vol vi. pp. 111–114) ; the present communication must be considered as an extension of that, and, in some sense, a revision. Throughout I have used the new nomenclature ; but, in the event of some of my readers not being familiar with the new nomenclature, I have, where any change of name has been made, indicated the old within brackets.

Limax cinereus, Müll. (=*maximus*, Auct.). Common in gardens; Severn side; Hartlebury.

Limax cinereus var. *johnstoni*, Moq. Garden in Stourport.

Limax cinereus var. *obscura*, Moq. Gardens in Stourport.

Limax cinereus var. *mülleri*, Moq. Hartlebury.

Limax variegatus, Drap. Cellars in Stourport.

Agriolimax agrestis var. *sylvatica*, Moq. Common everywhere.

Agriolimax agrestis var. *filans*, Hoy. Garden in Stourport.

Agriolimax agrestis var. *punctata*, Pic. Hartlebury; Crossway Green; garden in Stourport.

Agriolimax agrestis var. *albida*, Pic. Garden in Stourport.

Agriolimax agrestis var. *submaculata*, Wms. Wildon.

Agriolimax lævis, Müll. "Deep Meadow," Stourport; Lincomb Bay.

Amalia gagates var. *rava*, Wms. Garden in Stourport.

Amalia gagates var. *plumbea*, Moq. Garden in Stourport.

Amalia carinata, Leach (= *marginata*, "Müll." Drap). Garden in Stourport.

Hyalina cellaria, Müll. Lincomb Bay; Hartlebury.

Hyalina cellaria var. *complanata*, Jeff. Lincomb Bay.

Hyalina glabra, Stud. Lincomb Bay.

Hyalina alliaria, Mill. Lincomb Bay; "Deep Meadow."

Hyalina radiatula, Ald. "Deep Meadow."

Hyalina crystallina, Müll. Lincomb Bay.

Hyalina fulva, Müll. "Deep Meadow."

Arion ater, Linn. Common everywhere.

Arion ater var. *marginata*, Moq. Common.

Arion ater var. *brunnea*, Roeb. Bishop's Park, Hartlebury.

Arion ater var. *brunneopallescens*, Roeb. Lincomb Bay.

Arion hortensis var. *rufescens*, Moq. Garden in Stourport.

Arion bourguignati, Mab. "Deep Meadow;" Lincomb Bay.

Patula rotundata, Müll. (=*Helix rotundata*). Lincomb Bay.

Patula rotundata var. *alba*, Moq. Lincomb Bay.

Helix aspersa, Müll. Common everywhere.

Helix aspersa var. *undulata*, Moq. Dunley; Wildon.

Helix aspersa var. *flammea*, Pic. Near Hartlebury Common.

Helix nemoralis, Linn. Common everywhere.

Helix nemoralis var. *libellula*, Risso. 02345; Stourport. 12345, 123(45), 0000; Lincomb Bay. 00000. Dunley.

Helix nemoralis var. *rubella*, Moq. 00300; Crossway Green; Wildon.

Helix nemoralis var. *castanea*, Moq. On railway bank between Wildon and Stourport. (Mr. Kitching has shown me many specimens of this variety taken from his own garden at Bewdley.)

Helix nemoralis var. *conoidea*, Jenner. Wildon.

Helix nemoralis var. *trochoides*, Cless. Dunley.

Helix nemoralis var. *carnea*, R & T. Dunley.

Helix hortensis, Müll. Common everywhere.

Helix hortensis var. *albina*, Moq. Dunley.

Helix hortensis var. *arenicola*, Macg. Dunley.

Helix hortensis var. *pallida*, Ckll. Lincomb Bay.

Helix hortensis var. *lutea*, Moq. 00000; Lincomb Bay; Dunley; Astley; Arley; Mrs Clewer's Garden in Jenny Hole; Stourport; Crossway Green; Wildon. 1(2345), Mrs. Clewer's Garden. 12345; Stourport.

Helix hortensis var. *albina-fasciata*. Dunley; Mrs. Clewer's Garden in Jenny Hole.

Helix hortensis var. *subalbida*, Loc. 12345, (123)45, (12345), 1(2345), 12(345), (12)3(45), (123)(45), (1234)5, 1(234)5; Mrs. Clewer's Garden in Jenny Hole. 1(23)(45), (123)45, 12345, (1234)5; Mr. Pretty's Garden at Wildon. 12345, (123)(45), (12)345, (123)45; Dunley.

Helix arbustorum, Linn. Lincomb Bay; "Redstone Rock;" near Arley Wood.

Helix arbustorum, var. *pallida*, Tayl. Lincomb Bay.

Helix arbustorum var. *flavescens*, Moq. Lincomb Bay.

Helix arbustorum var. *conoidea*, Wst. Near Arley Wood.

Helix rufescens var. *rubens*, Moq. Lincomb Bay; Wildon.

Helixa rufescens var. *alba*, Moq. Lincomb Bay.

Helix hispida, Linn. Lincomb Bay; Dunley.

Helix hispida var. *concinna*, Jeff. Lincomb Bay.

Helix granulata, Ald. (=*sericea*, Auct.). Lincomb Bay; plentiful.

Helix pulchella var. *costata*, Müll. Lincomb Bay.

Helix lapicida, Linn. Mr. Glover of Stourport has given me one specimen which he found in Arley Wood. I have been unable to find this species in that locality, but there is no reason to doubt the genuineness of the "find."

Bulimus obscurus, Müll. Lincomb Bay.

Clausilia laminata, Mont. Lincomb Bay.

Clausilia laminata var. *albinos*, Moq. Near Hartlebury.

Clausilia rugosa, Drap. Charlton; Lincomb Bay.

Clausilia rugosa var. *gracilior*, Jeff. Lincomb Bay.

Cochlicopa lubrica, Müll. Lincomb Bay; "Deep Meadow."

Cochlicopa lubrica var. *hyalina*, Jeff. Lincomb Bay.

Cæcilianella acicula, Bourg. Plentiful in the "Deep Meadow."

Succinea putris, Linn. Lincomb Bay and on the

herbage along the banks of the Severn, the majority being very large specimens; near Hillditch Pool. (N.B.—In my list in "Journ. Conch." the word "Hillditch" has been spelt, as locally pronounced, "Hillage." The present is the correct rendering.)

Succinea putris var. *albida*, Sopp. & Cart. Lincomb Bay.

Succinea pfeifferi, Rossm. On the banks of the Severn and near Hillditch Pool; common.

Carychium minimum, O. F. Müller. "Deep Meadow."

Planorbis lineatus, Walk. Stinton Pool at Crossway Green; small stream near Wildon Iron Works.

Planorbis albus, Müll. Hillditch Pool.

Planorbis spirorbis, Müll. "Rush Pool," on Hartlebury common; small pool at Wildon; and pools in meadows near the Severn.

Planorbis umbilicatus, Müll (=*complanatus*, Auct.). Hillditch Pool; Bishop's Pool.

Physa fontinalis, Linn. Hillditch Pool.

Physa hypnorum, Linn. "Deep Meadow." and a ditch on the way to the Lickhill Manor House.

Limnæa peregra, Müll. Rivers Stour and Severn; Hillditch Pool; Stinton Pool; Rush Pool; Staffordshire and Worcestershire Canal.

Limnæa peregra var. *convoluta*, Wms. This peculiar form was first described by the author in the "Midland Naturalist" from a specimen collected in Hillditch Pool.

Limnæa peregra var. *ovata*, Drap. Hillditch Pool.

Limnæa peregra var. *labiosa*, Jeff. Hillditch Pool.

Limnæa auricularia, Linn. One specimen only was taken from the Staffordshire and Worcestershire Canal.

Limnæa glabra, Müll. Small Pool on Hartlebury Common (scarce); plentiful in a ditch in same locality. Large specimens in a ditch in one of the river meadows belonging to the "Coney Green" farm.

Limnæa palustris, Mull. A few specimens were taken from a ditch in a field belonging to the "Lickhill" farm.

Ancylus oblongus, Lightfoot (=*lacustris*, Linn.). On stones in Hillditch Pool; not plentiful.

Cyclostoma elegans, Müll. Mr. Kitching informs me that several specimens have been taken near Bewdley.

Paludina vivipara, "L." Auct. Staffordshire and Worcestershire Canal.

Paludina vivipara var. *efasciata*, Pic. Staffordshire and Worcestershire Canal.

Bythinia tentaculata, Linn. Hillditch Pool; Staffordshire and Worcestershire Canal; River Severn.

Bythinia tentaculata var. *fulva*, Loc. Hillditch Pool.

Bythinia tentaculata var. *albida*, Rimmer. Hillditch Pool.

Bythinia tentaculata var. *ventricosa*, Menke. Hillditch Pool; River Severn.

Valvata piscinalis, Müll. Hillditch Pool, but not plentiful.

Sphærium corneum, Linn. Hillditch Pool; Stinton Pool at Crossway Green; Wildon Pool; Staffordshire and Worcestershire Canal; River Severn.

Sphærium corneum var. *flavescens*, Macgill. Wildon Pool; River Severn.

Sphærium corneum var. *compressa*, Gray. Hillditch Pool.

Sphærium ovale, Fér. In my former list, this shell was recorded as being found in a "pool in Shrawley Wood (one dead specimen only)." This specimen was thrown back into the pool, and I have more than my doubts now whether I was not mistaken in the diagnosis. The pool has been searched thoroughly since, but no ovale were found. I am resolved that what I found was in reality a young specimen of *S. corneum* which approximated in shape to *S. ovale.* Will those interested kindly make a note of this correction? they will greatly oblige the writer by so doing.

Sphærium lacustre, Müll. Rush Pool (very plentiful).

Pisidium amnicum, Müll. Staffordshire and Worcestershire Canal; the species *par excellence* of the River Severn.

Pisidium pusillum, Gmel. Hillditch Pool.

Unio tumidus, Phil. Hillditch Pool.

Anodonta cygnea, Linn. Staffordshire and Worcestershire Canal,

Dreissena polymorpha, van. Ben. Staffordshire and Worcestershire Canal; Wildon Pool. In great plenty.

Dreissena polymorpha var. *dilatata*, Colb. Staffordshire and Worcestershire Canal.

In looking over the foregoing list two features will strike the reader: the total absence of such otherwise common species as *Limnæa stagnalis* and *L. truncatula*; and also the total absence of *Planorbis vortex*, although its usual congener, *P. spirorbis*, is comparatively abundant.

THE EGGS OF INSECTS.

By P. L. Simmonds, F.L.S.

MANY insects and their products have been described and figured, from time to time, in the long series of volumes of Science-Gossip, but a separate consideration of the eggs of some insects is not without interest. We utilise the eggs of various fishes, birds, and reptiles, but those of insects have comparatively small commercial value; only a few being taken any account of. Most insects are oviparous. There are some eggs which are use-

ful, as those of the silkworm, the cochineal insect, and a few which are eaten as food. The cochineal insect lays several thousand eggs on the cacti. An insect which deposits its eggs on the most forward of the figs hastens their ripening. Fig-growers have for ages taken advantage of the habits of *Blastophaga grossorum* for cross-fertilising the cultivated fig with the wild Caprificus.

Some fifteen or twenty years ago a very large trade was carried on in importing silkworms' eggs, on cards, from Japan to France and Italy, in consequence of the silkworm disease. In the eleven years ending with 1872, about two million pounds of these eggs were imported to each of these countries, costing over ten million pounds sterling! In December 1879, a consignment of silkworms' eggs, filling six freight cars, arrived at New York from Japan, viâ San Francisco. The eggs were packed in cases measuring three feet in length by about one foot in width and depth. Each case contained some 600,000 eggs, attached to strips of cardboard, separated by layers of tissue paper. From twenty to twenty-five of these cards were placed in each case; the cards contained about twenty-eight grammes of eggs, or from 30,000 to 35,000; each card was valued at 1*l*. The silk-moth in Japan lays about two hundred eggs. The silkworms' egg is the size of a pin's head, and is of great commercial value. When first laid the eggs are of a clear jonquil yellow, and if they are pierced, will pass successively through a series of tints till they arrive at their definite hue, an ashy grey; while if not pierced they will remain yellow. As the shell or covering is nearly transparent, these changes of colour, which are those of the germ which it encloses, may be successively watched. From experimental researches which have been made, it is found that the hatching may be retarded or advanced by regulating the temperature :—1. To prevent the eggs hatching

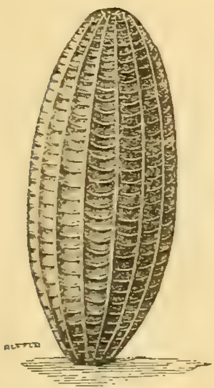


Fig. 133.—Egg of *Pieris brassicæ*.

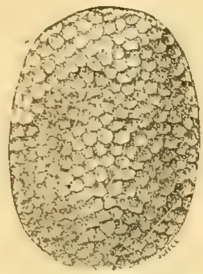


Fig. 134.—Egg of Magpie Moth.

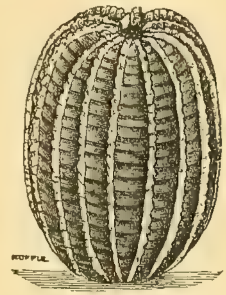


Fig. 135.—Egg of Red Admiral.

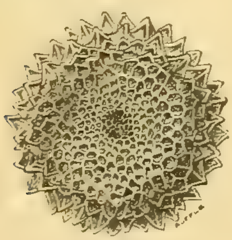


Fig. 136.—Egg of *Polyommatus corydon*.

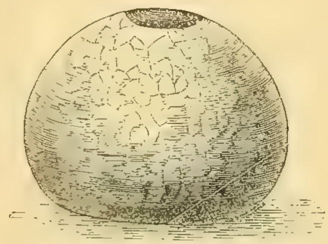


Fig. 137.—Egg of Buff-tip Moth.

Fig. 138.—Egg of Meadow-Brown.

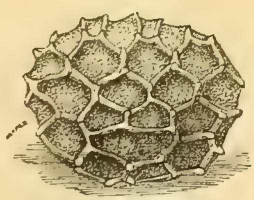


Fig. 139.—Egg of Small Copper.

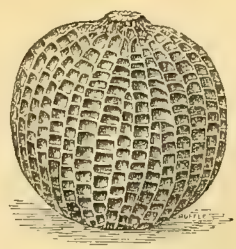


Fig. 140.—Egg of Cabbage Moth.
(All magnified.)

at the ordinary period, they should be preserved from the commencement in a temperature between fifteen and twenty degrees Centigrade, exposed to the cold for fifteen days, about three months before the time required for hatching, and then treated as ordinarily. 2. To have the eggs hatched before the ordinary period, twenty days after they have been dropped they should be exposed to the cold for two months, and then removed six weeks, afterwards they will be found in the same condition as normal seed, and can be treated in the same manner. The eggs in commerce bear the names of grain or seed.

The larva and nymphæ of ants are good food for poultry, and an old woman of Paris derived a good income for half a century from supplying the *Jardin d'Acclimatation* with these eggs for pheasants. These she collected in the woods around Paris, though almost devoured by the ants; but of their attacks she took little notice. Her harvest-time, of which she had a monopoly, lasted from June to the end of September. Ants' eggs are considered by many people a choice relish spread on bread-and-butter, and are excellent curried. They are eaten in Siam, forming an esteemed article of food, but being costly, are only obtainable by the rich.

Ants'-brood are subject to an import duty in some of the northern countries of Europe, especially in Denmark, Norway, and Sweden. In those states they are steeped in boiling water, and a kind of vinegar, or formic acid, is obtained. The eggs obtained in Mexico from three species of hemipterous insects, belonging to the group of aquatic beetles, are eaten.

These eggs are made into a sort of bread or cake, called "Hantle," consumed by the people, and it forms an article of commerce in the markets. In the fresh waters of the lagoons, bundles of reeds or rushes are laid, on which the insects (*Corixa femorale* and *C. muanaria*, Geoffroy, and *Noctonecta Americana*) deposit their eggs. The bundles of rushes are then withdrawn, dried and beaten over cloths, to detach the myriads of eggs. These are cleansed, sifted, put into sacks, and sold like flour, to form cakes, which are excellent eating, but have a fishy and slightly acid flavour. The eggs of another species, *Corixa esculenta*, having the appearance of manna, are eaten in Egypt.

The eggs of insects vary much in size and shape, but the round and oval are the most common form.

It is believed that there are five times as many kinds of insects as there are species of all other living things put together. The oak alone gives shelter and support to 450 species of insects, and 200 kinds make their home in pine-trees. Forty years ago Humboldt estimated that the number of species preserved in collections was between 150,000 and 170,000, but scientific men now say, that there must be more than three-quarters of a million, without taking into account the parasite creatures. Of the 35,000 species in Europe, however, there are not more than 3500 which are noxious or destructive. There are more than 100,000 beetles.

The eggs of many depredating insects are ruthlessly destroyed; among these especially come those of the locust tribe.

The grasshorpers, as they are called in North America, commit great devastation. According to one calculation, these insects lay 2816 million eggs per acre. This may be a greatly exaggerated estimate, but after every deduction is made, enough remains for serious alarm. The *Cicada*, or so-called locusts of America, make their periodical appearance, according to some, every seven, fourteen or seventeen years. They lay their eggs in May, and these are hatched in August. They are furnished with a boring-tube or ovipositor, about half an inch long, having joined to it on each side, a tolerably fair specimen of a saw. There are a great variety of species of these locusts: among others, *Acridium shoetone* and *A. Americanum*, *Dipostura longipennes*, and *D. spurcata;* the lesser migratory locust (*Caloptences Atlantes*), the detestable locust (*C. fœdus*) two-striped locust (*C. bivittatus*), large yellow locust (*C. differentialis*), devastating locust (*C. devastator*), Rocky Mountain locust (*C. spretus*), and winged locust (*Œdipoda venusta*, and *Œ. phanæcoptera*).

The egg masses contain from 30 to 150 in different species. In America grasshopper clubs are established, the members of which are pledged to destroy the eggs by deep ploughing, and the young grasshoppers by increasing the number of poultry kept, by preserving wild birds, and others means. Five dollars a bushel are given for their eggs. Guatemala, Costa Rica, and other parts of Central America have been occasionally visited by these plagues. About 1500 of their eggs weigh a pound.

On the coasts of the Mediterranean, Morocco, Algeria, Jaffa, etc., the locusts often appear in considerable numbers; millions of them may be seen covering the ground for miles, inches thick. The Arabs and peasants, on view of their approaching mischief, go through the land in thousands, digging for their eggs, and destroying incredible numbers with fire and water. In the subdivisions of Constantine, Setif, and Batna, Algeria, there were collected a few years ago, 14,000 bushels of locust eggs.

There are three or four very destructive and migratory species of locusts in Europe and Asia. There are also several other species which sometimes become very destructive, and still more rarely migrate from place to place, in the United States. But the Rocky Mountain locust is essentially the migratory and destructive species of North America, as none other compares with it in the vastness of its movements, or the injury which it inflicts. The value of the vegetation destroyed in 1874, in the State of Iowa,

was estimated at 2,000,000 dollars, and in that of Minnesota, at 3,000,000 dollars, a damage of over 1,000,000*l.* sterling.

There are other insects' eggs which are dreaded by the agriculturist, among which are those of the Hessian fly (*Cecidomya destructor*), which attacks the stalk of wheat. The fly breeds twice a year. The first brood of eggs, which are very small reddish grains, are deposited in the upper channel of the wheat leaf, soon after the stalk begins to bud out. They are hatched in about fifteen days.

The grain-weevil (*Calandra granatis*) attacks the grain at the time of ripening, and continues its ravages long after it is harvested. A single pair, it has been asserted, will multiply to five or six thousand during one year. The wheat-midge (*Cecidomys tritici*) is another ravager, which lays its eggs on the blossoms and soft immature grain, and the eggs hatch in six or eight days.

The eggs of moths are laid on the young shoots or on the bark of the plant on which the caterpillar has to feed, and the way in which they are laid is often very strange. The common lacquey moth (*C. Neustria*) makes a ring or bracelet round the twigs of the hawthorn, covering the eggs with a kind of cement, which is an effectual covering.

The egg of a moth or butterfly is found of various shapes, sizes, and colours (some being ribbed or smooth, others hemispherical or spherical, and others cylindrical) and of a green, brown, or dusky white colour. A study of these eggs under the microscope is well worth the trouble of procuring them. They possess extraordinary vitality, neither baking nor freezing producing any other effect than making the exclusion of the caterpillar earlier or later.

The night-butterfly often devastates the Prussian and Polish forests, eating down acres of pine-trees, leaving the trunks perfectly bare. The eggs cover them as a layer. Some years ago, in the course of a few months, 300 lbs. of their eggs were collected in one district only, equal to about 150 million insects.

If we turn to flies, millions of eggs are laid by them, whence proceed in a day or two innumerable devourers of dead flesh. The common house fly (*Musca domestica*) lays from 120 to 150 eggs; *M. Cæsar* and *Sarcophaga camarria* are equally prolific; and after a few days, when perfect flies, these in their turn lay about 150 eggs, which in two weeks become flies again, and so on. It is no wonder, therefore, their numbers increase so rapidly.

The eggs of dozens of other predatory insects have to be kept under by birds or the devices of man.

The eggs of the walking-stick insect (*Eurycantha horrida*) a native of New Guinea, are said to be as large as those of the small humming-bird. This insect was figured in SCIENCE-GOSSIP for March, 1875.

NOTES ON THE INFUSORIA.

By BERNARD THOMAS.

VII.

BESIDES the single varieties of the Vorticellinæ, there are others on branching stalks that live in colonies. Among these may be mentioned Epistylis, Zoothamnium, and Carchesium. In the first the stalk is not contractile; in the second the stalk is contractile, but not the main stem, while in Zoothamnium the whole tree is contractile.

33. *Zoothamnium spirale* (Fig. 141, A, B, C) is a marine species sometimes found with Polyza. It is an exceedingly beautiful form. It may be compared to a branching tree with little bell-like organisms instead of leaves. Some of the bells are small; others, of much larger size, are arranged in the axils of the branches. When the protoplasmic thread contracts, the whole tree bunches up and the stem is lost among the bells crowded closely together. Then the stem slowly expands again, somewhat spirally, and the bells gradually open and their cilia begin to play. The individual bells closely resemble Vorticella, but the nucleus is round and not a bent rod. A delicate protoplasmic thread may be seen traversing the stalk and branching with it. In Goss's "Tenby" there is a beautiful illustration of this species, and the following short description: "*Zoothamnium spirale:* pedicle slender, spirally bent; branches short, neither umbellate nor verticellate, but set spirally on the trunk; bells sessile, spirally arranged, with a terminal one; large bells few, axillary. Inhabits sea-water." Besides *Z. spirale* there are other species, as *Z. arbuscula*, which is described as racemose, umbellate, the branches all coming from the top of the stem. It inhabits fresh-water.

34. *Epistylis nutans* (Fig. 141, D). The bell resembles somewhat that of Vorticella. The œsophagus is ciliated. Where the bell joins the stalk the cuticle is jointed, and this permits a nodding movement of the bell. *Carchesium* is another branched Vorticella. It is a very beautiful form and inhabits fresh-water.

35. *Trichodina pediculus* (Fig. 144, A, B) has no stalk and lives attached by a sucker-like base to some other organism. I have studied the morphology of this little infusorian, which I found in large numbers on a black Planarian. The Planarian can easily be procured for examination. It is a black, slug-like animal about one-eighth of an inch long, which crawls about the bed of the pond. As I have made the little infusorian the subject of a former paper, I will only briefly describe the morphology. The undersurface is concave with circular outline. In the centre there is a hole and round this a ring of protoplasm. Outside this ring are short radiating bars. This is the "muscular" apparatus hy means of which Trichodina attaches or detaches itself. Surrounding the base

is a fringe of long vibratile cilia, which is used by the organism when it swims freely about. Trichodina, although usually described as parasitic, does not appear to be so, for the mouth is situated on the upper surface, between a disc and peristome, in a similar manner to Vorticella, and the "bell" can be opened and closed by a similar mechanism. Indeed the organism resembles a free Vorticella bell newly cast off from the stalk. The sucker-like arrangement must be considered as representing the stalk of Vorticella.

The genera Vaginicola and Cothurnia both live in a case.

36. *Vaginicola crystallina* (Fig. 142, A) is also known as *Cothurnia crystallina*. The case, into which the animal sometimes retreats, is shaped like a vase (urceolate), and is sessile on the filament to which it is attached. The organism somewhat resembles Vorticella, but the œsophagus is ciliated. In the interior their are green particles. The length of this organism is about the two-hundredth of an inch.

37. *Cothurnia maritima* (Fig. 142, B) and the other species of this genera much resemble the preceding. The carapace or case is, however, stalked, and fixed by the blind extremity. The length of this species is about the two-hundred-and-fiftieth of an inch. As the name implies, it is a marine species.

C. inerbis inhabits fresh-water.

38. *Scyphodia* (Fig. 143, A) is another genus of the Vorticellinæ, and the specimen shown in the illustration was found attached to a Cyclops. Another species of the large family of Vorticellina is shown in Fig. 143, B; it was furnished with chlorophyll corpuscles.

Fig. 141.—*Zoothamnium spirale.* A, Low power extended. B, Low power contracted. C, High power. D, *Epistylis nutans.*

Fig. 142.—A, *Vaginicola crystallina.* B, *Cothurnia maritima.*

IV. SUCTORIA OR ACINETÆ.—This family is the last of the Infusoria here considered, and it is a very peculiar and interesting one. The members of this group have a protoplasmic body, with nucleus and contractile space, and so far they resemble the preceding. In the absence of food-vacuoles and presence of tentacles or suckers in place of cilia they differ from the Ciliata. They are usually sessile, attached by a stalk, sometimes protoplasmic, to the bodies of the Entomostraca, etc. Sometimes they are furnished with a delicate case.

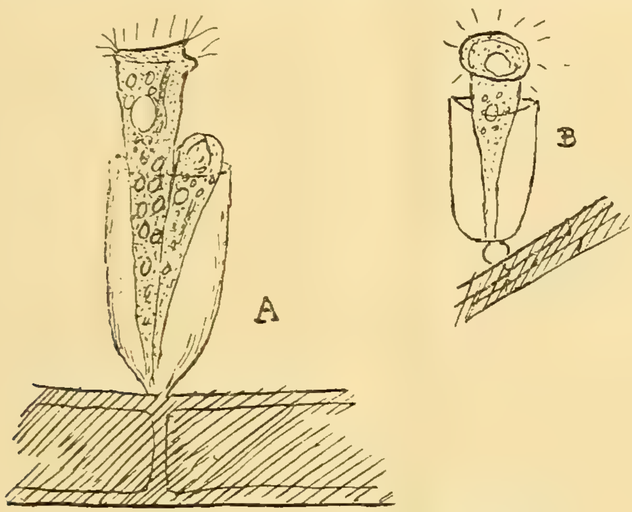


Fig. 143.—A, Scyphodia on antenna of Cyclops. B, Vorticellina.

Fig. 144.—*Trichodina pediculus.*

The suckers or tentacles which replace the cilia, and which may be considered as a modification of them, are delicate tubes each furnished with a disc at its free extremity. These tubes can be slowly withdrawn into the body and slowly protruded again. The Suctoria feed on infusoria or other minute organisms, and are parasitic. When food comes in the vicinity of one of these organisms, some of the suckers are attached to it, and others play the part of tentacles to hold the prey. The little disc at the end of the tube expands, and thus becomes more firmly fixed. The food particles drawn from the soft body of the luckless host are said to be seen traversing the tube to pass into the interior of the parasite's body. There are several members of this family. Perhaps at a subsequent date, if space is afforded me, I may trespass again on the reader's time to mention them.

Sufficient has been said to show not only how complex the cell of the infusorian may become, but also how diverse and numerous are the forms of this interesting group. Compared with the Amœba, how much the cell of the higher Ciliata is differentiated.

It is needless, perhaps, to remark that only a comparatively few examples have been mentioned. It would require a very large work indeed to embrace all the species, and this task would be rendered the more difficult as every year adds new forms to the list.

SCIENCE-GOSSIP.

AT a recent meeting of the French Biological Society some interesting facts were brought before the notice of the members. The faiths and folklore of ancient observers are worthy of attention. For instance, the gipsies have long claimed the ability to read off the lines of the open hand, and this knowledge they have elevated to the science of palmistry. Wandering gipsies are keen observers, as every country policeman is assured. But the females of

their tribes, apart from any low cunning connected with the crossing of the examined palm with silver, have everywhere a deep and earnest belief in the characteristic lines and markings of the open human hand. The human skin is a terrible revealer of secrets, whether it be the face or the hand. There is a palmistry of the face as well as of the palm. The human skin, like that other thicker one we call the "crust of the earth," accumulates wrinkles the older it gets. Every line which marks a face or a continent, is either one of energy, or one expressing the lack of it. Are the gipsies very far wrong, therefore, in their endeavours to construct a knowledge of individual human character from the lines of a human hand? The French Biological Society does not appear to think so, although the gipsies are not referred to. At a recent meeting, one of its most eminent members produced a large and important collection of the impressions made of the skin of the thumb. Thumb-marks are a very ancient and convenient form of seal impression. We have seen them on Egyptian and Assyrian bricks, as well as on the sham wafers of wills. Indeed, the criss-crossing seen on a will or deed which has to be signed is only a rude representation of the lines of the inner surface of the finger or thumb which has to be laid thereon, usually when the deed or will is subscribed to. Gipsies have long declared that these markings of the interior of the human palm and fingers denote character, and they profess to be able to read them. However that may be, Professor Féré has recently shown that in the case of epileptic patients the "thumb-marks" are quite different from those in sane and wholesome persons. In one half of the impressions he produced and exhibited, they are unsymmetrical from right to left. The impressions of the finger and thumb-marks of lepers have also been found markedly to differ from those of healthy relatives. The cause assigned is that of nervous degeneration.

OUR readers have heard the story of the man who was born blind, and who on being asked his ideas concerning the colour of scarlet, said it must be like the sound of a trumpet. He was not far wrong in this respect, for physiologists and psychologists have now discovered a distinct relationship between colour and sound. A distinguished scientist, Professor Gruber, has been experimenting in this important department of research for years past, and has just given to the world the results of his valuable experiences. To a very small number among his best educated patients the sound of the vowel "e" was accompanied by a sensation of yellow colour; of "i," by blue; of "o," by black; and so on through the long list of vowels and diphthongs, and also to some extent with numbers. The same colour was not always induced by the same sound in different patients, but the observations have been carefully tested.

WE are pleased to notice the organ of the Malden Natural History Society ("The Gazette"), the July No. of which contains "The Dragon-flies of the Months," July, by Mr. Harcourt Bath; "A Short Treatise on the Structure and Habits, etc., of Birds," by William E. H. Pidsley. A further account of "The Mole" (*Talpa vulgaris*), and "Snake Catching," by Dr. Arthur Stradling, C.M.Z.S., etc.

THE "Naturalist's Journal," first issued in July last by W. P. Collins, 157, Great Portland Street, W., will prove handy to collectors of Natural History objects. Mr. Harcourt Bath has inserted a few interesting notes on Reptiles. There are notes on rare butterflies, and other articles, bringing together facts and captures from various parts of the country. The magazine is well printed and got up.

ONE of our most greatly disliked, and perhaps too abundant, English birds is the common sparrow. He is such a dreadful Bohemian. Being an English bird, the sparrow has naturally his likes and dislikes. As a natural grain-consuming bird, he makes war upon the insectivorous kinds. It has recently been discovered that sparrows have a particular dislike to certain colours, such as "purple" and "blue." A correspondent in *Nature* states that some caged sparrows he had would not touch their food if he put strips of blue paper upon it; that they manifested a discourteous dislike to ladies who came into the room wearing blue dresses, and that several of them were cured of the vice of pecking at a certain part of a wall they had access to by plastering a piece of blue paper over it. Our English sparrows are terrible Radicals, especially where blue happens to be the Liberal colour. It is not often our good fortune to apply political colours to practical ends, but here is a good suggestion for young Conservative farmers:—Let every shock of wheat in the cornfield, by way of experiment, be bound up with a strip of blue, whose colour it has been demonstrated sparrows greatly dislike.

IT can hardly be wondered at, considering its fatal action in Hamburg and elsewhere, that cholera is just now a matter of considerable microscopical study by scientists. It is now generally accepted that this dreaded disease is due to the enormously rapid growth of a bacillus or germ, known as the "comma" bacillus from its shape. It has been found that they grow more rapidly in ordinary artificial culture solutions when the latter contain milk-sugar, but their growth ceases when lactic acid is mixed with it. It is suggested, therefore, that the best drink for cholera patients would be lemonade into which some lactic acid has been mixed. A good many rotten apples will soon be lying about. Science has discovered that rottenness so called (fitly regarded as a sign of mortification) is only a birth from death unto life. It is a good illustration of how Nature

works up her waste organic materials. The apple-rot is produced by a parasitic fungus, which, singularly enough, is the same as that which causes the ripe-rot in grapes. It is an infectious fungus, and can be passed on from one fruit to another. The grapes affected by it become transparent and wither up, whereas in the apple it causes the surface to be covered with brown spots, which spread very rapidly.

TIME flies, but scientific discovery travels faster. Twenty years ago the civilised world stood aghast at the thought that every country was exhausting its limited coalfields. John Stuart Mill, John Bright, Professor Jevons, and others took up the subject. Professor Hull had calculated how long our British coalfields would last at the then rate of consumption (we have nearly doubled the rate since then). It was a gloomy outlook. A period in the future, perhaps not farther distant than that which separates us from Queen Elizabeth's time, would find us without a shovel of coal. England is, above all things, a manufacturing nation. Without coal how can we manufacture? To say nothing of cheerless and fireless homes, unlighted by gas, our very livelihood as a producing country, our country's future, depended upon it. No wonder that men's faces settled into sadness as they thought of the time when the coalfields of the world would be exhausted.

IT is with a sense of relief we now feel that we shall be locomotived, warmed, lighted, and furnished with even more motive power than we can use when there is not a single ton of coal left in the world. Nature superabounds in energy. Here is the cataract of Niagara giving up only 3½ per cent. of its mighty force, and yet that will be sufficient to furnish the city of Buffalo, eighteen miles way, with all the illumination and motive power it requires. As long as the winds blow, waters flow, and tides rise and fall, we shall be possessed of more energy than we can consume. It can be transferred into electricity, and the latter can re-transform it into light, heat, and motion. With the exception of the tides, all terrestrial energy comes to us from the sun, and coal only represents the stored-up excess of solar energy of an ancient geological period as distinguished from that of to-day, which lifts the watery vapours from the surface of the ocean, distils them into rain, allows them to gather into rivers, descend as cataracts, and in the latter form to liberate the solar energy which has been expended. Coals and cataracts are very nearly related.

THE importance of insects to flowers has been fully substantiated within the last few years. Indeed it is highly probable there would never have been any flowers at all if there had never been any insects. Professor Riley, a celebrated American entomologist, has gone a step further and shown how important are the services of certain insects in the formation of such fruits as the fig. In the production of the best Smyrna figs certain minute insects are necessary to the fruitification. The tree which produces the edible fig, does not yield fruit of fine flavour unless the latter are fertilised by the aid of these insects. Figs are raised in California, but the fruit is very insipid. Professor Riley says this is due to the fact of the absence of the insects which in Smyrna produce such fine fruit. He recommends the Californian Government to take up the subject, and introduce the insects from Smyrna into California.

ONE of the worst things which can happen to an Englishman living in hot countries is an attack of bilious fever. A French physician has just proved that this is due to a special kind of bacteria, which he has successfully cultivated. The bacteria is motionless, but is accompanied with numberless moving spores. An unfortunate pig was inoculated with the cultivation, and it had the bilious fever directly.

"A HAIR of the dog that bit you" is an old remedy. It has been found that people afflicted with shaking palsy are greatly relieved by travelling long journeys in fast trains. The greater the oscillation the better they are. Dr. Charcot, noticing this, has had a chair made to which a rapid side to side movement is given by electricity. The effect is to give a healthy man nausea, but a palsied patient enjoys it, and after a quarter of an hour in it is a different man. He stretches his limbs, loses fatigue, and enjoys a good night's rest afterwards.

MICROSCOPY.

DR. A. M. EDWARDS, of Newark, U.S.A., kindly sends us the following "Microscopical Notes":—

SUBSTITUTE FOR GLASS FOR COVERS AND SLIDES FOR THE MICROSCOPE.—I think the price of slides and covers for microscopic use is enormously high, and as they can be made of a substance much cheaper, and at the same time possessing properties which glass has not, viz., being unbreakable, that it should be known. In using celluloid, which is wood rendered soluble in ether and alcohol with gum camphor, for films for microphotography, I was struck with some of its properties, that made me think it could be used in microscopy. It is transparent, almost as transparent as glass, unbreakable, the weight is very little, making it especially valuable when sending by post, and therefore occupying very little room, which can thus be dispensed with. It is strong as wood, and stronger, has no fibre, and can be cut readily with scissors. I really wonder that it has not been used before for slides and covers. It can be obtained with a ground surface as well as plain, and the cost, which

is a great item, is next to nothing. Very thin celluloid films are commonly used for instantaneous coverers, and this can be employed for both, whilst the thicker kind used for ordinary photography makes capital slides. In fact I have some an inch square, which I use in this way, mounting it temporarily in a glass slide for use on the microscope. Let all microscopists try it and they will not repent.

THE USE OF A SUBSTITUTE FOR CANADA BALSAM.—The use of a substitute for Canada balsam for mounting objects for microscopic use has long been an object of research with me, and in fact I have employed a hundred of different media and rejected them one by one, until I got the one I am about to describe. I use the gum thus or frankincense, which is the gum or balsam of the *Pinus tæda*, L, (loblolly or old field pine) which is found in Virginia and southward, common. In Florida it is very common, constituting the "Pine Barrens" of that state. It was described in the "Dispensatory of the United States of America" sixteenth edition, 1889, by Wood and Bache, and by Wood, Remington and Sadtler, as from the *Pinus Australis*, Mich. (*Pinus palustris*, Mill.), and *Pinus tæda*, Linn. It is dissolved in alcohol. A saturated solution is made by adding ordinary alcohol to a large quantity of the gum and set by for a day or so, until it is dissolved. The clear solution, which is darker than balsam, is poured off, and three parts acid to one of oil of cinnamon is added to nine. This is the solution that is used for mounting. The gum thus is more highly refractive than Canada balsam alone, and when we add to it oil of cinnamon, we use liquid of the highest refractive powers that we can use. To use it we dry the substance, diatoms or other substance, in the cover or slide, and add with a dipper (an iron wire is good) a drop or two of the solution. We then warm it until the alcohol is flown off and bubbles formed are driven off, and the cover is pressed on the glass slide, and the whole cooled. The slide is then cleaned with solution of ammonia (I use a weak "Household Ammonia"), or carbonate of soda, or borax and water. A ring of asphaltum or gold size can then be turned around the cover, and the mounting is done. It will be found that the mounting is easy as compared with Canada balsam, for no turpentine is used, and as no sticky residium is used, the cleaning is also easy. I think that those who use it will be pleased with the results, and Canada balsam mounts be sent to the limbo.

ROYAL MICROSCOPICAL SOCIETY.—The August number of the journal of the Royal Microscopical Society, besides its usual summary of current researches relating to Zoology and Botany, Microscopy, etc., contains a capital "Note on the process of oviposition as observed in a species of Cattle-tick," by R. S. Lewis, F.R.M.S., illustrated by eight beautifully executed woodcuts.

MASON'S PROJECTION MICROSCOPE.—Unfortunately, in the notice of this excellent instrument, we had not received the blocks for illustration, which we

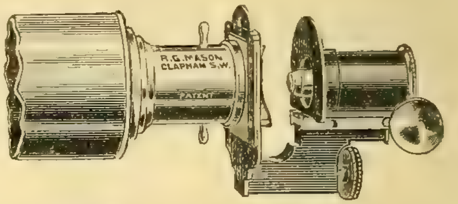


Fig. 145.—Mason's Lantern or Projection Microscope.

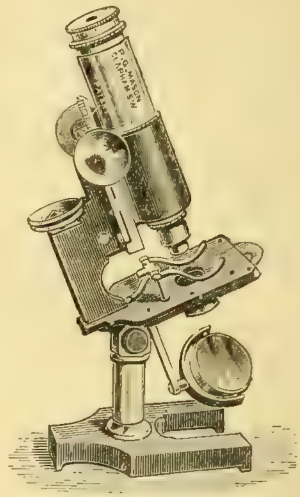


Fig. 146.—Ditto, used as a Microscope only.

intended to use so as to give our readers an idea of its make and fittings. We have now the pleasure to insert the illustrations, and to repeat our appreciation of this Projection Microscope.

ZOOLOGY.

MYMARIDÆ.—Will you give me space for a few notes in connection with my short paper on "Fairy Flies" in your number for August, p. 176? (1.) When I said that the fly emerged from the egg "in the handsome form you see him, without any transitions through the grub and pupa stage," I meant that he underwent no such changes after his emergence from the butterfly's egg, for within it, and after exclusion from his own proper egg, he certainly underwent them. (2.) In my table the genus Litus is misplaced; the tarsi are five-jointed, and not four, as stated. (3.) The term "marginal band" is puzzling. A good entomologist says it means the subcostal vein, and I have so described it in my table; but I cannot see that it is punctiform in Cosmocoma, and its peculiarities are in several cases difficult to make out. (4.) Since my paper appeared I have seen an admir-

able one on the same subject by Mr. Fred. Enock, published in the "Midland Naturalist" for June, 1885. The description he gives of the appearance and habits of the different Fairy-flies is very interesting.—*Thomas E. Amyot.*

THE CINNABAR MOTH (*Euchelia Jacobeæ*) AND ITS VARIETIES.—May I be allowed to correct an error in the September number, and ask Mr. Anderson if the larvæ are not to be found in July and August instead (as stated) in the spring?—*C. Morley, Ipswich.*

PENZANCE NATURAL HISTORY AND ANTIQUARIAN SOCIETY.—In the "Report and Transactions of this Society" for 1891–92, are very many exceedingly interesting and instructive papers. Among the monthly excursions may be mentioned those to Marazion, Truro, and Castle-an-Duias, as very entertaining; while the account of the annual excursion is very graphic and lucid. "Old Chywoon" by J. B. Cornish is, although not universally coincided with, a valuable contribution; as is also the "Rejoinder," by Mr. G. F. Tregelles; the Rev. S. Rundle's paper "Cornish Tavern Signs," is short, but well put together. Mr. George Bown Millet's, "On Two old Manuscripts," is illustrative of the ancient form of correspondence. "Church Architecture in Cornwall," by Mr. Preston, B.A., is what archæologists have been wanting for some time. "The Ancient Patron of Ludgoan," by Rev. Courtenay, and "Penzance Market Cross," by George Bown Millet, will both be appreciated; together with "Notes on the Dialect," and "The Tomb of Margaret Godolphin." The "Description of an old Mine Pump," by Fred. Holman, is good reading. "Sea Anemones and Corals of Cornwall," together with the "Fauna and Flora" of the same district, will be valuable to many naturalists.

THE SIBERIAN SANDPIPER.—The *East Anglian Daily Times* of September 7th, states that in the latter part of August a visitor to Great Yarmouth, from near Birmingham, was collecting birds on Breydon Water, and took his "bag" to Mr. W. Lowne, the well-known naturalist of Fuller's Hill. Mr. Lowne was struck by the appearance of a bird of the Sandpiper genus, and took it up to Mr. Thomas Southwell, F.Z.S., of Norwich. The bird has been identified as the Siberian Sandpiper, a variety of the Pectoral Sandpiper, and quite new to Britain, if not to Europe. As Norfolk and Suffolk both claim birds killed upon Breydon Water, this will be an interesting addition to the county fauna. Professor Newton has compared the bird with the specimens in the British Museum at South Kensington, which places the fact beyond any doubt.

THE ESSEX NATURALIST.—The August number of this journal contains the finishing chapter of a long article on a subject, about which information and instruction is much needed: "The Preservation of Marine Animals for Zoological Purposes," by J. T. Cunningham M.A. An account of a visit to the Museum of the Royal College of Surgeons, and a Field Meeting in the Writtle and Blackmore High Woods, and in Writtle Park, June 29, 1892, and original and selected notes on *Colias edusa*, *Damasonium stellatum*, and "On some Plateau Deposits at Felstead and Slebbing.

BOTANY.

DOUBLE-FLOWERED DAHLIA.—Mr. W. H. Grattan writes as follows:—"By to-day or to-morrow you will, I hope, receive a box, containing the bloom of a dahlia, from which is produced a stalk terminating in another flower, equally strong and brilliant as the primary. Is not this very unusual? However, it appears to me so remarkable, that I have directed my landlord, a very intelligent young man, to put up the flower and send it to you, trusting it will arrive in good condition, and if so, I hope you will be able to give some kind of notice of the vegetable curiosity in the September number of SCIENCE-GOSSIP. I am here on a brief visit, but I still reside in Torquay, which address, with my name, will always find me."

CORONILLA VARIA.—In the March number of this year, I read of the occurrence of *Ornithopus roseus* growing on the banks of the Severn, near Dowles Church. As I had gathered four years ago an umbellate leguminiferous plant there that I was unable to identify by reference to Hooker, the thought immediately occurred to me, is my old find the same plant. I accordingly went in search of it on the 27th July last, and found it growing in great profusion at the same spot, I then sent a specimen to the Kew Herbarium, and, by the kind courtesy of the director was informed that the plant was *Coronilla varia*. Believing that this is the same plant as that recorded by Mr. J. E. Nowers in your March number, I send you this brief note, and should be happy to send Mr. Nowers a pressed specimen of the same.—*Carleton Rew.*

GEOLOGY.

SAND MARKINGS.—In crossing the beautiful estuary of the Dovey a few days ago, I noticed a small tuft of Carex growing in the slimy sand, with its leaves reclining, as they generally do, so as to touch the surface of the soil in which they grew. When these wiry leaves, of various lengths, were wafted to and fro by the wind they described certain figures on the moist surface, which it would be difficult, if not nigh impossible to account for, had not the cause and

process been witnessed. These tracings would be covered by the next high tide with a coat of similar material and thus preserved to puzzle the future geologist, should he chance to find them. It is hardly necessary to observe that the operation would be repeated on the successive surfaces until the plant would decay or disappear, and that, possibly, many fossils which puzzle the present geologist may be referred to such agencies.—*G. Rees*, *Aberystwyth.*

THE "Proceedings of the Geologists' Association" for July, edited by F. A. Bather, M.A., F.G.S., contains the following articles: "On Geological Tours," by Horace B. Woodward, F.G.S.; an account of an "Excursion to the Cuttings on the new railway between Upminster and Romford, Essex, March 5th, 1892;" "Visit to the British Museum (Natural History), March 19th, 1892," and to that of W. H. Hudleston, Esq., F.R.S., President of the Geological Society;" also to that of Practical Geology (Jermyn Street); and accounts of excursions to Devizes, Swindon, Faringdon, Abingdon, Hendon, Finchley, Walthamstow, Wendover and St. Albans.

NOTES AND QUERIES.

NORTH STAFFORDSHIRE NATURALISTS' FIELD CLUB.—The third excursion of the season was made under the leadership of Mr. Wells Bladen, to Haughton, Aqualate, and Newport. The party, which numbered forty-five, on arrival at Stafford drove by way of Castle Church and Bury Ring to Haughton, where they were met by the Rector, the Rev. G. T. Royds, who pointed out the chief objects of interest in his beautiful church, which is dedicated to St. Giles, and which was completely restored in 1887, Mr. J. L. Pearson, R.A., being the architect. Mr. Royds also directed the attention of the members to the Old Hall, a half-timbered building of the time of Henry VIII., which is in a very perfect state of preservation. The next halt was made at Gnosall, where a few minutes were spent in the church, which was much admired. From here the party drove direct to Aqualate, where, by the kindness of Sir T. F. Boughey, Bart., the hall, the gardens, the pleasure-grounds, and the mere were thrown open to the members. The mere was the chief attraction, anxious inquiries being made for the heronry. Many of the members were disappointed on finding they could only get a view of it across the water, but at least one visited it. The nests are built in Scotch firs; but as the nesting season is over, very few birds were seen about. It is a very interesting fact that each year one or more pairs of birds nest in the reeds on the mere. We have not seen this habit recorded before. The heron is no doubt very destructive to fish, but it is to be sincerely hoped that notwithstanding this grave fault in the eyes of fish preservers, it may be long before this beautiful bird, like its near relative the bittern, is driven from its breeding-places in this country. It is to men like Sir Thomas Boughey, and to places like Aqualate, that we are indebted for many of our rarer British birds. Another rare, and in this county very local bird, the great crested grebe, was observed, and the sweet song of the reed-warbler was heard on all sides. In the pleasure-grounds many magnificent forest-trees were greatly admired, one oak-tree, said to be 900 years old, being especially noticed. At half-past three a start was made for Newport, where the Rector (the Rev. W. T. Burges) met the members, and read a very interesting paper on his church, of which St. Nicholas is the patron saint; its restoration, which is just completed after ten years' work, has cost £10,000. After visiting the ancient butter-cross the members sat down to tea at the Royal Victoria Hotel. At the subsequent meeting, the general secretary, the Rev. T. W. Daltry, in the chair, several new members were elected, and five were nominated for election at the next meeting. Votes of thanks to Sir T. F. Boughey, the Rectors of Haughton and Newport, and the Leader having been passed, the party re-entered the carriages and drove by way of Forton, Sutton, Woodseaves, and Ranton Abbey to Great Bridgeford Station, where they joined the train, and arrived at Stoke at 7.30.

BROWN HAIRSTREAK AND CLOUDED YELLOW.—I have discovered the haunts of both these butterflies in the neighbourhood of Llandyssil, South Wales. On August 25th I captured *Thecla betulæ* (a female) near Llanfair. Last year also I had one near the village on the road to Llanybyther. The brown hairstreak seems to resort to brambles on the edges of oak-woods. *Colias edusa* is plentiful this year on the heaths belonging to Fairdrefawr Farm.—*T. Alfred W. Rees, F.R.M.S.*

SEXUAL SELECTION.—What is meant exactly by the phrase "Sexual Selection"? It seems to me that the words may be used in two senses. According to one, suppose that a certain peculiarity in the males, say, of a species gave an advantage to its possessors in the struggle for existence. Then certain females would admire this peculiarity, and consort by preference with males possessing it. Their male offspring would, by virtue of possessing the peculiarity have an advantage over the male progeny of others, and they would transmit the tendency to admire the peculiarity to their female descendants. So the peculiarity would go on increasing, and, at the same time, the liking for it in the females would go on increasing too. So far, however, the sexual selection would be merely helping to do work which would be done by natural selection without its aid, although more slowly; but when the peculiarity had reached such a degree of development that its further increase was no longer beneficial to the species (although not actually injurious), unaided natural selection would give no further advance, but the mental tendency in the females would still remain, and under its influence the peculiarity would go on increasing until a point was reached at which further increase would be actually detrimental. Using the phrase in this sense, sexual selection seems to me to be à priori probable enough. In the other sense, we have to suppose that for some unknown reason, all or most of the females of a species simultaneously conceived an admiration for some peculiarity in the males which was of no advantage in particular in the struggle for existence, and that this objectless liking persisted through successive generations, causing the peculiarity ultimately to reach a high stage of development. This seems to me to be so highly improbable à priori that it would require very good evidence to make me believe it had taken place in any particular instance. Of course, in order that some special peculiarity should be developed by sexual selection of the first kind it is necessary that a slight degree of development should be beneficial to the species.—*J. R. Holt.*

MALLEE HENS.—Mallee hens are more like a pheasant than any other bird, but larger: they are very good to eat, and their eggs are still better. They lay a very large egg, about the size of a duck's; It has a very thin shell and no inside skin, which makes it hard to carry them without disastrous results. The way they hatch their eggs is peculiar: first they scratch up a large heap of leaves, twigs and sand, and about this time of the year (June) they scoop the middle out like a great basin; then in the spring they lay in the hollow and cover the eggs up with sometimes two feet of leaves, etc., making the nest conical. Each day that an egg is laid the bird opens the nest, and covers it again, which is quite an undertaking, as with your hands it takes a considerable amount of work to get down to the eggs. The eggs are always well arranged and sometimes, when two or three hens use the same nest, there are a dozen or fifteen eggs, the fresh ones on top, so the puzzle is, how do the young ones get out when hatched? N.B.—I have no idea what "mallee hens" are—perhaps someone else may know the proper name.—*E. C. Pope, South Galgogrin Station, N.S. Wales.*

VARS. OF HART'S-TONGUE FERN.—A specimen of the *Scolopendrium vulgare.* (the hart's-tongue fern), which a friend brought from Ireland two years ago, has undergone all the changes which I notice Newman mentions as the different varieties of the *S. vulgare.* In 1891 the leaves were crisped, as in *S. crispum*, and this year the fronds are also crisped and a few of them bifid, as the specimen of frond enclosed. Is this variation due to cultivation or evolution, or how can it be reasonably explained?—*P. Kilgour.*

THE CLOUDED YELLOW.—After a lapse of fifteen years the clouded yellow butterfly (Edusa) has again made its appearance in numbers in this neighbourhood. In 1877 Edusa was abundant in Suffolk and other counties, but since that year I have not seen, at most, more than two or three in a season. Early this year I heard from various parts of the country that several insects of this species, presumably hybernated specimens driven over from the continent, had been captured, and I was therefore led to hope that 1892 would be an "Edusa year," which hope was verified. A curious fact in connection with the appearance of the butterfly this autumn, here, has been the large preponderance of males over females. As far as my observation goes, the former are to the latter in the proportion of about ten to one. I do not know if there is any explanation of this, nor if it is general over the country, but it is possible that the female does not fly as much as the male, and may therefore be overlooked; but even supposing this to be correct, it would hardly account for the enormous difference between the numbers of the sexes. Amongst other specimens I was fortunate enough to secure a couple of the white variety, Helice, one of which seems to be an intermediate form between Edusa and Helice, being more orange in tint than any previous capture of mine. As well as my memory serves me, Edusa has not been so abundant in 1892 as in 1877, but still there have been large quantities on the wing. Hyale has also put in an appearance, but in much more limited numbers than its relative. I managed, however, to net some ten specimens, and had I gone further afield I should probably have obtained more, as these were all caught on two small pieces of clover near here. I have heard two theories given to account for the irregular appearance of these two species at long intervals. The first is that they are blown over from the continent when they hatch out in August; the second is that a few insects coming over in the spring lay their eggs here, and after passing through the various stages, the butterfly emerges from the chrysalis in the late summer. Either of these ideas seems feasible, but bearing in mind the capture of several Edusæ in the earlier months of this year, the latter seems the more probable. I should be glad to know what other entomologists think on this point, and also how the excess of males over females mentioned above can be accounted for, or whether it is only an accidental occurrence.—*L. Creaghe-Haward, Bramford, Ipswich.*

PRESERVING DRAGON-FLIES.—Can any reader of SCIENCE-GOSSIP tell me of a method of preserving dragon-flies and caterpillars so that the colours will not fade?—also whether there is any method of preserving toad-stools?—*L. Edwards.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

TO ANONYMOUS QUERISTS.—We must adhere to our rule of not noticing queries which do not bear the writers' names.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply DISGUISED ADVERTISEMENTS, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges," which cannot be tolerated.

WE request that all exchanges may be signed with name (or initials) and full address at the end.

SPECIAL NOTE.—There is a tendency on the part of some exchangers to send more than one per month. We only allow this in the case of writers of papers.

TO OUR RECENT EXCHANGERS.—We are willing to be helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

M. S. SYKES.—Many thanks for the couple of splendidly developed and well set-out American silk-moths. The caterpillars arrived safely, and greedily fed on privet, and are doing well.

W. G. CLEMENTS.—The editor would be very pleased to receive the illustrations and photos of webs, etc., referred to in Mr. Clement's note, as well as the proposed paper on their natural history.

T. P. R.—No; the mountain ash berries are not poisonous. On the contrary, many years ago they were among our winter fruit preserves. The mountain ash is really a pear (*Pyrus aucuparia*). The berries make a good conserve, when pulped, and are said to be good for rheumatism and paralysis.

H. D.—We shall be very pleased to have the series. Be kind enough to employ utmost accuracy in the pen-and-ink drawings, and to send them early.

I. G.—The abnormal growth in *Plantago lanceolata* is of common occurrence—perhaps it is the commonest of all vegetable teratological occurrences. Many thanks for the interesting specimens. The *double-flowered* var. of *Calluna vulgaris* is very unusual.

W. G. CLEMENTS.—Send us any natural history notes and observations you can, as well as illustrations, photos, etc. We shall be glad to make use of them.

R. BEER.—You cannot do better than procure Thome's "Manual of Botany" (abundantly illustrated), translated and edited by A. W. Bennett, published by Longmans, price 4*s*. 6*d*.

EXCHANGES.

WANTED to exchange, eggs of sooty tern, noddy, Bartram's sandpiper, cuckoos, etc. Wanted, owls, harriers, shrikes, oriole, redwing, bluethroat, wagtails, woodlark, buntings, serin, raven, woodpeckers, hoopoe, ptarmigan, quail, ruff, dunlin, etc., in clutches.—W. Wells-Bladen, Stone, Staffs.

WANTED, the two volumes of Claus and Sedgwick's "Zoology" (English). Can offer in exchange a large series of first-class marine microscopical slides.—S. C., Post Office, Lower Tottenham, London.

WANTED, British dragon-flies, grasshoppers, locusts, cock-

roaches, earwigs, and crickets (especially mole and field-crickets). Offered, books, butterflies, and shells.—W. Harcourt Bath, 195 Ladywood Road, Birmingham.

DUPLICATE North American land and freshwater shells. Desiderata, European zonites, any locality, or shells not in collection.—Robert Walton, M.A.A.C., Houghton Street, Lower Roxborough, Philadelphia, Pa., U.S. America.

WANTED, micro. accessories or slides, in exchange for "Boy's Own Paper," vols. xii., xiii., 1890, 1891, and SCIENCE-GOSSIP for 1888 and 1889, both in monthly parts.—C. W. Lyne, 18 The Avenue, Eastbourne.

WANTED, foreign and British land and marine shells, and birds' eggs; also tokens issued from the following places: Newcastle-on-Tyne, Sunderland, Stockton, South Shields, and other north of England towns. Can offer in exchange foreign stamps and coins.—J. S. Wood, Walker Gate, Northumberland.

OLDHAMIA, graptolites, trilobites, ammonites, polished Devonian corals, silurian and carboniferous fossils would be given for early volumes or parts of "Journal of Society of Chemical Industry," "Journal of Chemical Society," "Chemical News," Allen's "Commercial Organic Analysis," and original parts of Dickens', Lever's, or Thackeray's works.—G. W. Davies, F.C.S., 8 Longshut Lane, Stockport.

WANTED, good secondhand cabinet for birds' eggs, containing about 150 partitions. Please send offers to—W. G. Clutten, 19 Berkeley Street, Burnley.

A COMPOUND monocular microscope with B eye-piece, 1 in., ½-in., and ¼-in. dividing lens, sliding-tube and fine screw adjustment, stand, etc., all finished brass and lacquered. Wanted in exchange, good ¼-plate camera, or offers, photographic or microscopic.—Peter Kilgour, 164 Lochee Road, Dundee, N.B.

EXOTIC butterflies: *Urania rhypheus*, *Orn. Brookiana*, *Priamus*, and *Morpho cypris*, the four most beautiful butterflies known—five duplicates; also many other rare and splendid species. Also wings of morphos, uranias, etc., for the microscope.—J. C. Hudson, Railway Terrace, Cross Lane, near Manchester.

L. C., 8th ed. Offered, 202, 271, 814, 923, 1192, 1540, 1720, 1726, 1745, 1760. Desiderata numerous.—T. M. Lowry, Kingswood School, Bath.

WANTED, eggs of kestrel, buzzard, kingfisher, tree-pipit, shrike, woodpecker, sea-birds, goshawk, and many others, in exchange for rare duplicates.—Jas. Ellison, Steeton, Keighley.

WANTED, well-mounted microscopical slides of pathogenic bacilli, comma, anthrax, etc., in exchange for West African insects, all orders, and land shells.—Dr. Clements, Frindsbury, Rochester.

WANTED, some pupæ of *Smerinthus ocellatus*, *S. populi*, and larvæ of *Lasiocampa quercifolia*; also pupæ of *Telea cynthia*, *Samia cecropia*, etc. (from America preferred). Will give good returns; store-boxes, book pattern, perfectly new, etc., offered. Write for particulars.—R. Laddiman, 25 Hellesdon Road, Norwich, England.

WANTED, a few numbers of "Nature," 1892 preferred. Will give Alston Moor minerals in exchange.—William Hetherington, Nenthead-by-Carlisle.

L. C., 8th ed.: 65, 115, 137, 145, 315, 320, 335, 402, 493, 503, 525, 544, 574, 587, 636, 648, 691, 705, 771, 783, 885, 942, 955, 958, 1013, 1097, 1100, 1101, 1116, 1126, 1134, 1142, 1262, 1316, 1324, 1427, 1437, 1465, 1476, 1477, 1479, 1496, 1497, 1510, 1529, 1533, 1538, 1544, 1570, 1616, 1698, 1755, 1757, 1759. Desiderata in cyperaceæ and gramineæ particularly wanted.—W. Biddiscombe, 60 St. James's Place, Plumstead, Kent.

OFFERED, "History and Natural Arrangement of Insects," Swainson and Stuckard, Newman's "Entomologist," Nos. 1 to 6, containing analytical notice of above work, "Lectures on Entomology," by J. B. Burton (coloured plates), Wood's "Aquarium" (plain plates). Exchange land or freshwater shells, coleoptera, lepidoptera, or birds' eggs.—C. Coles, 61 Barrington Road, Brixton, London.

OFFERED, *Helix rhodocheila*, etc., for helices not in collection. Also flint arrow-heads, etc., cave period, from South of France.—W. A. Gain, Tuxford, Newark.

OFFERED, Quadrant tandem bicycle, and two ladies' bicycles, nearly new. Required, microscope, camera, books, or offers.—W. Kirk, 20 Lombard Street, West Bromwich.

DUPLICATE clutches of great northern diver, fulmar, Manx shearwater, red-breasted merganser, carrion crow, little grebe, ring-dove, sooty tern; couples, mute swan, Canada goose, capercaillie, side-blown and with data. Wanted, others.—F. W. Paple, 62 Waterloo Street, Bolton.

WANTED, good botanical slides, also any of the following shells: *Vertigo Moulinsiana*, var. *pusilla*, *Limnæa involuta*, *Acme lineata*, *Avicula hirundo*, *Isocardia cor*, *Terebratula caput-serpentis*, in return for other rare shells, microscopic objects, etc.—T. E. Sclater, Natural History Stores, Teignmouth.

THE "Entomologist," 7 vols., bound, 1882–88. Will exchange for back numbers of SCIENCE-GOSSIP previous to 1884, 1876 excepted, or botanical works.—G. E. Nowers, Blackpool Street, Burton-on-Trent.

A MICROSCOPE by Johnson, 1 in. and ¼-in. objectives, spot lens, line troughs, condenser by Baker, and about four dozen choice slides, etc. Exchange for a safety bicycle of good make.—Heaton, 80 Frampton Park Road, South Hackney.

DUPLICATES.—*A. aglaia*, *V. Atalanta*, *V. cardui*, *S. hyperanthus*, *C. davus*, *C. pamphilus*, *L. Alexis*, *Z. loniceræ*, *C. Jacobœa*, *C. caja*, *L. monacha*, and eggs, *A. ulmata*, etc. Wanted, marine or exotic shells.—J. W. Boult, 17 Finsbury Grove, Fountain Road, Hull.

Good fossils offered in exchange for British dragon-flies.—A. Tarver, 11 Westbury Road, Croydon, Surrey.

OFFERED, sets and eggs of peregrine, chough, s. hawk, dipper, stonechat, goldcrest, coal-tit, long-tailed tit, creeper, rock-pipit, corn-bunting, reed-bunting, twite, hooded crow, magpie, nightjar, rock dove, pheasant, ringed plover, oyster-catcher, c. sandpiper, snipe, landrail, mute swan, tufted duck, red-breasted merganser, little grebe, gannet, cormorant, shag, black guillemot, ringed guillemot, razor-bill (white), puffin, swift tern, noddy, herring gull, kittiwake, Manx shearwater, storm-petrel, and nests with small eggs. Wanted, complete clutches equally good.—R. J. Ussher, Cappagh, Lismore, Ireland.

WHAT offers in foreign land, freshwater or marine shells, for good live shells of isocardia, pinna, *Fusus antiquus*, etc.?—F. W. Walton, Mount Stuart, Rothesay.

OFFERED, British and foreign land, freshwater and marine shells, darts of helices, etc. Wanted, foreign shells. Foreign correspondence desired.—A. Hartley, 14 Croft Street, Idle, near Bradford, Yorkshire.

WHAT offers for "The Student," vol. ii. (half-bound); SCIENCE-GOSSIP for 1890 (unbound), and General Index to same for first 12 vols.; "The Ludgate Monthly," vol. i. in 7 parts (unbound); Harris and Power's "Manual for Physiological Laboratory," 4th ed.?—E. Pratt, Northendene, Streatham Common, S.W.

DUPLICATES.—Ova of *Liparis salicis*, *Hespialus hectus* and *velleda*. Desiderata, lepidoptera in any stage not in collection.—Thos. Sparkes, 92 Heywood Street, Moss Side, Manchester.

WANTED, *H. nemoralis* and *hortensis* with band formulas: 12305, 12340, 12005, 12300, 02045, 02305, 02340, 10305, 10340, 12005, 12040, 02005, 02040, 02300, 10040, 12000, 10000, 02000, in exchange for others or fossils.—G. K. Gude, 5 Gresbach Road, Upper Holloway, N.

WANTED, foreign land shells in exchange for European and exotic butterflies, or moths. List sent.—Col. Parry, 18 Hyde Gardens, Eastbourne.

BOOKS, ETC., RECEIVED FOR NOTICE.

"The Migration of Birds," by Charles Dixon (London: Chapman & Hall).—"Smithsonian Report" for 1890 (Washington: Government Printing Office).—"Missouri Botanical Garden Report," 1892 (St. Louis, Mo., published by the Board of Trustees).—"The Entomologists' Record" (London: Elliot Stock).—"Bulletin of the Microscopical Society of Calcutta."—"The Fauna and Flora of Gloucestershire," by Chas. A. Witchell and W. Bishop Strugnell, assisted by numerous contributors (Stroud: Geo. H. James).—"A Primer on the Art of Massage," for learners, by Dr. Stretch Dowse (Bristol: John Wright & Co. London: Simpkin, Marshall, Hamilton, Kent & Co. Ltd.).—"Woodwork, Carpentry and Joinery," by Thos. C. Simmonds. (London: Bemrose & Sons, 32, Old Bailey; and Derby).—"The Truth about Alcoholic Drinks," scientifically considered, by W. K. Fulleylowe. (Coventry: Curtis & Beamish).—"Journal of the Royal Microscopical Society," (London: Williams & Norgate).—"Penzance Natural History and Antiquarian Society." (Plymouth: William Brendon & Son).—"The Annals and Magazine of Natural History." (London: Taylor & Francis).—"Nature Notes," The Selborne Society's Magazine. (London: H. Sotheran & Co.).—"Geological Magazine." (London: Kegan Paul, Trench, Trübner & Co.)—"The Entomologist." (London: West, Newman & Co.)—"The Naturalist." (London: Lovell Reeve & Co.)—"The Botanical Gazette." (Bloomington, Indiana).—"The Naturalist's Journal," July and August. "Proceedings of the Geologist's Association," (London: Edward Stanford).—"The Art of Modelling in Clay and Wax," by Thos. C. Simmonds. (London: Bemrose & Sons).—"Supplementary Report upon the Testaceous Mollusca of the L.M.B.C. District," by the late Francis Archer, B.A.—"Experimental Evolution," by Henry de Varigny, D. Sc. (London: Macmillan & Co.), etc, etc.

COMMUNICATIONS RECEIVED UP TO THE 11TH ULT. FROM: W. W.—W. W. B.—J. E N.—C. H. A.—W. T. S.—J. I. W.—G. T. W.—W. P. W.—W. H. G.—A. H. D.—D. S. S.—W. H. N.—W. L.—S. C.—C. M.—H.—A. H. S.—J. S. W.—W. G.—C. W. L.—W. L.—E. D. M.—J. H.—L. G.—J. G.—T. A. W. R.—W. K. F.—I. I. V.—R. W.—W. H. B.—A. E.—L. C. H.—T. E. S.—T. M. L.—W. H.—W. H. B.—W. A. G.—E. W.—F. T. W.—R. L.—J. R. H.—C. C.—F. W. P.—W. B.—W.—K.—R. J. U.—G. R.—W. G. C.—J. E.—G. W. D.—E. M. N.—G. E. N.—T. H. E. A.—W. G. C.—J. C. H.—R. T.—M. L. S.—P. K.—R. B.—A. H. S.—G. K. G.—G. S. P.—V. C. M.—W. M. R.—W. P.—F. Z. S.—T. H. W.—E. B.—D. C.—E. K.—J. W. T.—etc., etc.

FERTILIZATION OF ORCHIDS WITHOUT POLLEN.

By J. H. A. HICKS, F.R.H.S.

DURING the last two years I have made many observations and experiments in reference to "Parthenogenesis" in flowers of the Orchidaceæ. Irritating the stigmatic surfaces of many flowers nearly always resulted in the swelling of ovaries and the production of parthenogenetic or adventive seeds.

Treub once discovered a larva in the ovary of *Liparis latifolia*, which apparently seemed to subsist on the juices secreted within the ovarian cavity; by its movements, and without the interference of pollen, the ovules were apparently stimulated into development.

Darwin, in the first edition of his great work on the "Fertilization of Orchids," mentioned that the ovaria of matured flowers of Acropera do not contain any ovules, but in the second edition of the same work he says, "I erred greatly in the interpretation of this fact, for I concluded that the sexes were separate. I was, however, soon convinced of my error by Mr. Scott, who succeeded in artificially fertilizing the flowers with their own pollen. A remarkable discovery by Hildebrand, namely, that in many orchids the ovules are not developed unless the stigma is penetrated by the pollen-tubes, and that their development occurs only after an interval of several weeks or even months, explains the state of the ovarium in Acropera, as observed by me. According also to Fritz Müller, the ovules of many endemic Epidendreæ and Vandeæ in Brazil remain in a very imperfect state of development for some months, and even in one case for half a year, after the flowers had been fertilized. He suggests that a plant which produces hundreds of thousands of ovules would waste much power if these were formed and did not happen to be fertilized, and we know that fertilization is a doubtful and difficult operation with many orchids. It would therefore be an advantage to such plants, if the ovules were not at all developed until their fertilization was assured by the pollen-tubes having already penetrated the stigma."

In many orchid flowers the ovules are dormant and extremely rudimentary, but they can be developed into parthenogenetic or adventive seeds by mechanical irritation of the stigma without pollination. And it does not always follow because suitable pollen has been applied to the stigmatic surface of a flower that all the ovules will develop into good seeds. For in many flowers after pollination the ovary begins to lengthen, and although the pollen-tubes also lengthen, only a few of the ovules are fertilized by them, the others being developed into parthenogenetic seeds through irritation.

Henslow, in his highly-interesting volume, "The Structure of Flowers," refers to some of Mr. O'Brien's experiments, who says that, "By placing small pieces of grit on the stigma, I found that the ovaries would swell in many cases, just as though the flower had been properly fertilized by pollen. This same result often takes place in orchid flowers under cultivation, and seed-vessels are obtained of full size, but, of course, with no vitality in the grains within."

Three flowers of *Orchis mascula* and two of *Ophrys apifera* were treated in the same manner, and resulted

in the withering of the petals and the swelling of the ovaries.

One flower of *Disa grandiflora* was similarly treated, and in a few days the flower had faded, and the ovary was observed to be swollen.

A terminal flower of *Ionopsis utricularioides* was also similarly treated, and the result was the same.

So sensitive to external stimuli are some orchid flowers, that I found the sleeve of a lady's dress, which accidentally rubbed against a terminal flower of *Stanhopea tigrina*, had caused it to wither in two days after its expansion.

On another occasion I observed that a small fly, by walking over the stigmatic surface of a cut flower of *Odontoglossum rossii majus*, on a table in my room, resulted in the withering of attractive parts, and a marked swelling of the ovary. The fly did not remove the pollinia, for it was caught and carefully examined with a lens, but no trace of pollen-grains could be detected on it. The flower was also examined, and the pollinia were found entire and undisturbed.

On another occasion the stigmatic surface of *Miltonia russelliana* was irritated by a human hair for several seconds, and was then withdrawn: this operation resulted in the withering of the attractive parts of the flower and the swelling of the ovary.

In some instances I found the degree of sensibility to be diminished or intensified in flowers of the same plant, as well as in flowers of the same species of different plants.

In spite of the extreme sensibility of orchid flowers to external stimuli, and their many and varied adaptations to secure cross-fertilization, they set an exceedingly small amount of good seed, which is probably due to the degeneracy of the essential organs, "the structure of which," says Professor Henslow, "when microscopically examined, at once becomes apparent. First, with regard to the pollen. Instead of its being in well-formed distinct grains, each with its extine and intine, their development is arrested and, while still in contact, a common extine clothes the whole of each massula. Moreover, it is only after the pollen-mass has been placed upon the stigma, that the development is continued. With regard to the pistil, the first sign of degeneracy is seen in the parietal placentation which prevails, and more especially in the rudimentary character of the ovules, every part of which is degraded. Even after fertilization the embryo cannot grow to maturity, but remains in the pro-embryonic condition. Having no albumen or nucellus-tissue wherewith to nourish the embryo, the suspensor does its best by elongating and escaping from the micropyle, and then, fastening itself like a parasite upon the placentas, extracts nourishment therefrom, the result being that myriads of seeds never succeed (at least in cultivation) in developing even the pro-embryo; and one can only infer that such is the case in nature."

A NEW BRITISH WORM.

By the Rev. Hilderic Friend, F.L.S.,
Author of "Flowers and Flower-Lore," etc.

I RECENTLY received a consignment of earthworms from the neighbourhood of Bangor, which contained, in addition to more than one species new to Wales, one which is new to Britain, and probably also to science. I have named it *Allurus tetragonurus*, the reason for which may at once be assigned.

In 1874, Dr. Gustaf Eisen published in the *Ofversigt af Kongl. Vetenskapp-Akad.*, No. 2, a paper on New England and Canadian worms, in which he described among others a tiny species from Niagara, which he regarded as the type of a new genus. This genus he named Tetragonurus, or the quadrangular-tailed, and supplied the following diagnosis:—

"Body cylindrical in front, quadrangular behind. Male pores on segment 11 [= the 12th segment according to our English mode of reckoning], setæ in approximate pairs, lip or prostomium not dividing the first ring or peristomium. It comes nearest to the genus Allurus, from which it is distinguished, however, by the position of the male pore, which in Allurus is on segment 12 [= 13 in English], but in Tetragonurus on 11 [= 12], as well as by the lip failing to cut the buccal segment or peristomium."

Eisen next supplies details of the species *Tetragonurus pupa*. "Lip or prostomium small, acuminate in front, pallid, not dividing the peristomium. Male pores small but conspicuous; the girdle prominent, usually composed of five segments, namely, 17–21 [= 18–22]. *Tubercula pubertatis* conspicuous, three on each side of the girdle, occupying the 18th, 19th, and 20th segments [= 19, 20, 21]. About 40 segments in all, length about 25 mm.

Some Swedish comments are added, from which, in addition to the foregoing facts, we learn that there are only six segments between the male pore and the first girdle segment. The tubercula are in the form of a wart-like prominence or keel, extending over three segments. The girdle is well marked and easily distinguished from the adjoining portions, and stretches over five segments, one of which is before, and the other behind the segments bearing the tubercula. The colour is sienna brown, becoming light red on the back part. The worm closely resembles Allurus, to which it approximates more nearly than to any other, if one has regard to the living forms; while it also frequents similar habitats, namely such places as lie near water.

Eisen further supplied an illustration with his diagnosis, but thus far I have found no one who has discovered the worm elsewhere. Early this year I took a form in the South of England which I thought would prove identical therewith, but some leeches devoured all my specimens on the journey to the north.

I have now to describe the worm from Bangor, which very nearly resembles Eisen's species in some respects, though it is abundantly distinct therefrom in others.

Allurus tetragonurus (Friend) is about one and a half inches in length, somewhat cylindrical before, quadrangular behind, and tapering from the girdle towards each extremity, so that the latter portion of the tail is only one half the diameter of the girdle. This latter organ is very prominent, of a yellowish orange colour, and closely fused, so that the segments are only distinguished with difficulty. The fore part of the body is sienna brown, the hinder part a dull yellow brown, closely resembling the light variety of Allurus, (*A. luteus*, Eisen, not *A. flavus*, Friend). The total number of segments is about eighty-five. The head is very small, and does not cut the first segment. The male pores are also very small and inconspicuous, but are certainly situated on segment thirteen as in the other species of Allurus, and not on the twelfth, as in Eisen's Tetragonurus. The position of the male pores is a point of great importance in the identification of genera, but the method of attachment between the lip or head, and the first segment or peristomium is so variable, that it cannot be relied on as a key to genera, though it may be of particular value for specific purposes. I have shown this in connection with a small Dendrobæna or tree-worm which was formerly called *Lumbricus Eiseni* (Levinsen), but is now shown to be closely related to the other tree-worms.

The question now remains, did Eisen make a mistake respecting the exact position of the male pore? I dare not insinuate such an idea, because, with the exception of Rosa, we have no foreign authority who can compare with him in accuracy of observation. For the present, therefore, we must assume that we have two worms which are practically identical in every important respect (length or number of segments being no criterion) except in the position of the male pore, which in our British species is on the thirteenth segment, and so ranks it with Allurus, but in Canada is on the twelfth, and thus constitutes a new genus named Tetragonurus.

No.	Segments occupied by			Length.	Segments.	Colour.
	Girdle.	Tubercula.	Male pore.	mm.		
1	18–22	19–21	12	25	40	Brown
2	18–22	19–21	13	30	85	Brown

If this is a fact, it must have a meaning, and it will be interesting to observe how future research will enable us to decide the question. Meanwhile it is very pleasant to be able to add another new species to our indigenous list, if not to the records of science.

The tabular view of the two worms which is appended, will show at a glance the differences and similarities existing between them. No. 1 represents *Tetragonurus pupa* (Eisen). No. 2 stands for *Allurus tetragonurus* (Friend).

THE CLOUDED YELLOW.

THIS year Edusa is apparently everywhere. Down near Penzance my brother has marked his joyous, untiring flight over Cornish meadows; in Pembrokeshire he has flourished, and become the living flower of the breezy heaths and sweet-smelling clover-fields. Here at Llandyssul he is in almost every open spot.

I say *he* because *Mrs. Edusa* is either very rare or possesses such a stay-at-home disposition, that, at least by myself, she is the vision of a thing hoped for, and not yet overtaken. In fact, I have made her acquaintance only once, and that for a brief moment. I missed with the first stroke, for the reason that as I was preparing to come down she was also preparing—to go up, and she, alas! had the start. Away she went, gambolling with an admirer in the further realms of blue. Then down came the latter on to a flower. By-and-by she also descended, but, scurrying across the heath, was soon lost to sight. The approximate colours of the neighbouring rag-wort, together with an awkward tumble into some brambles on my part, had much to do with her disappearance from my excited eyes.

Concerning the Clouded Yellow, a contributor to SCIENCE-GOSSIP, writing from Ipswich, says: "I have heard two theories given to account for the irregular appearance of these species at long intervals. The first is, that they are blown over from the continent, when they hatch out in August; the second is, that a few insects coming over in the spring, lay their eggs here, and after passing through the various stages, the butterfly emerges from the chrysalis in the late summer. Either of these ideas seems feasible, but bearing in mind the capture of several Edusæ in the earlier months of the year, the latter seems the more probable." I beg to differ from the above opinions, for it appears to me that *neither* of the ideas is feasible.

Cardiganshire is too far remote from the Continent for insects to cover, in one day, the distance between. I may state that after about four days of continuous rain and north winds, when butterflies are scarcely ever abroad, I found, on the following morning, which was bright and sunny, that Edusæ were roaming perfect and as fresh as daisies, over the clover-fields and up the sunny slopes of the hill-side. If these had come from France, they must have arrived during the sunny weather which preceded the four wet days. And this being the case, they would have been spoiled by the journey and the succeeding bad weather. But to contradict this first theory they all

were, as I have before stated, very evidently newly-emerged from the chrysalis.

It is ridiculous to suppose that butterflies could possibly travel long distances to particular localities, against the wind, through showers and comparative gloom. Moreover, after this trial, if completed, they would surely be tattered specimens. Thirdly, it is a sheer impossibility for a butterfly, presented to the world about 8 a.m., in France, to travel thence to Cardiganshire so as to arrive at 10 or 11 o'clock the same morning.

Passing on to consider the question of a few hibernated specimens immigrating to form the nucleus of a large autumn brood, I must candidly admit that to me there does not seem an atom of probability in this story. Hibernated Edusas are rare. In localities where the autumn broods appeared in greatest numbers, I had not seen a single hibernated insect in the previous spring. And if these were to be the parents of the autumn flies, they must have frequented the same localities as those in which their progeny were to emerge.

I cannot imagine, even if such a thing did happen, how these hibernated Edusæ should be so widely and evenly distributed and at the same time possess sufficient strength to become the parents of such a healthy brood as naturalists have noticed almost everywhere. Supposing, by some miracle, that swarms were taken on the breast of some strong south wind, and wafted over the seas from the mainland, what myriads there must have been to populate nearly the whole country with their offspring in the following autumn! and these myriads hibernated specimens! I cannot believe that such swarms would appear in spring. Even if they did appear, would they be immediately taken by Zephyrus, and wafted and dispersed in thousands here and there, over an area of hundreds of miles?

My own idea (it is only an idea) is that the appearance of such numbers of *Colias Edusa* at intervals is an accidental occurrence, dependent upon certain other accidents in environment—food-plants, weather, certain winds and degrees of temperature, absence of peculiar parasites, etc., which perchance, affecting only the first, second, or third stages, have resulted in the superabundance this year, of the male imago.

Still the question is extremely interesting to pursue until a complete explanation is arrived at.

In 1887, the insect was abundant near Cork. A friend of mine brought over a number of good specimens, all but one of which were males. By-the-bye, the insects which I have in my cabinet are all rather large and brightly coloured—not so dark as others from farther south. For myself, I shall be very anxious to note the approach (and circumstances connected therewith) of next August, and *Colias Edusa*. Three Brown Hairstreaks (*Thecla betulæ*) that I have captured in this neighbhourhood were all females.

T. Alfred W. Rees, F.R.M.S.

POND LIFE STUDIES.

No. II.—Daphnia pulex.

By H. Durrant.

THE subject of this paper is one that is familiar, I should say, to every nature-lover. The comparatively large size of Daphnia renders it extremely liable to figure frequently in the trough of those whose friends like to see "something alive" under the microscope. As to its haunts I need say nothing, I am convinced; and its plenitude—well it is this genus which one often notices in such numbers that the water is coloured to a deep red by their presence. General: Here is its position in the animal world:—Sub-kingdom, *Annulosa;* Class, *Crustacea;* Division, *Entomostraca;* Legion, *Branchiopoda;* Order, *Cladocera;* Family, *Daphniadæ;* Genus, *Daphnia;* Species, *pulex.* These little creatures have only a single eye, as in Cyclops, and are enclosed between, and protected by, a shell (doubled over, according to Jurine) without any indication of a hinge. The head projects beyond this shell in the form of a prominent beak. There are four to six pairs of feet, terminated in a pectinate manner. With the exception of the two first, they are provided with branchial laminæ. Antennæ, two; largish; arm-like, divided into several branches, placed on a peduncle, the fringed filaments always projecting and serving as oars. Eggs situated on back. Body terminated by a kind of claw with two filaments of extreme fineness at the end. Latreille gives the following sub-genera:—*Polyphemus*, Müller; *Daphnia*, Müller; *Lynceus*, Müller: (*Chilodorus*, Leach?). The division in Baird's "Entomostraca" includes the following:—

Daphniidæ.

Daphnia.	Sida.
Moina.	Macrothrix.
Bosmina.	Daphnella.

The two other families I leave out, as having no bearing on our present subject. Of the Daphnia, Schæfferi is the largest, being about one-fifth of an inch in length by two lines broad.

Specific: *Daphnia pulex*, Latreille; *Monoculus pulex*, Linnæus; *Pulex aquaticus arborescens*, Swammerdam; *Le perroquet d'eau*, Geoffroy; *Daphnia pennata*, Müller; *D. ramosa*, Koch; *Pou aquatique*, Joblot; *Vermes minimi rubri*, Bennett; *Puceron branchu*, Trembley; *Animaletti aquatici*, Redi. This is the common water-flea. Head rounded above and produced into a beak. Antennæ; superior under the beak; very small; inferior large. Anterior branch four-jointed, the first joint being very short; a filament arises from end of the third; fourth joint terminated in a like manner by three filaments. Filaments plumose. Valves of the carapace oval; dorsal margin not serrated; terminated by a longish serrated

spine. Eye spherical, bluish black; composed of about twenty crystalline lenses. It is quite included within the shell, but it is very distinct, and its quick and rotatory (to some extent) motions are observable with ease. Labrum with a large hairy swelling at the end. Jaws composed of a strong process, furnished at the extremity with four horny spines; three of them are incurved. Mandibles, a fleshy-looking body; geniculated, and furnished at the end with three small teeth. Legs; there are five pairs. Female, first pair, three-jointed; on outer edge of second segment are three minute processes, with four (often five) long, jointed setæ. Last segment small, with a few setæ. Male: they are more slender here, between it and the back of the animal until hatched, when the young make their escape. Frequently, however, the little things still stay on in their safe retreat, until more able to fend for themselves. The eggs are large and, as a rule, few in number, but surrounded by such advantages that there are few but what reach maturity. This is evidenced by the fact, that they are seen in such battalions, as to actually colour the water, as before mentioned. Baird remarks, that they will sometimes assemble so as to form a belt, a foot or more in breadth and ten or twelve yards in length, and that the whole belt will pass round the pool. Let a shadow fall across this enormous assembly, however, and it disappears

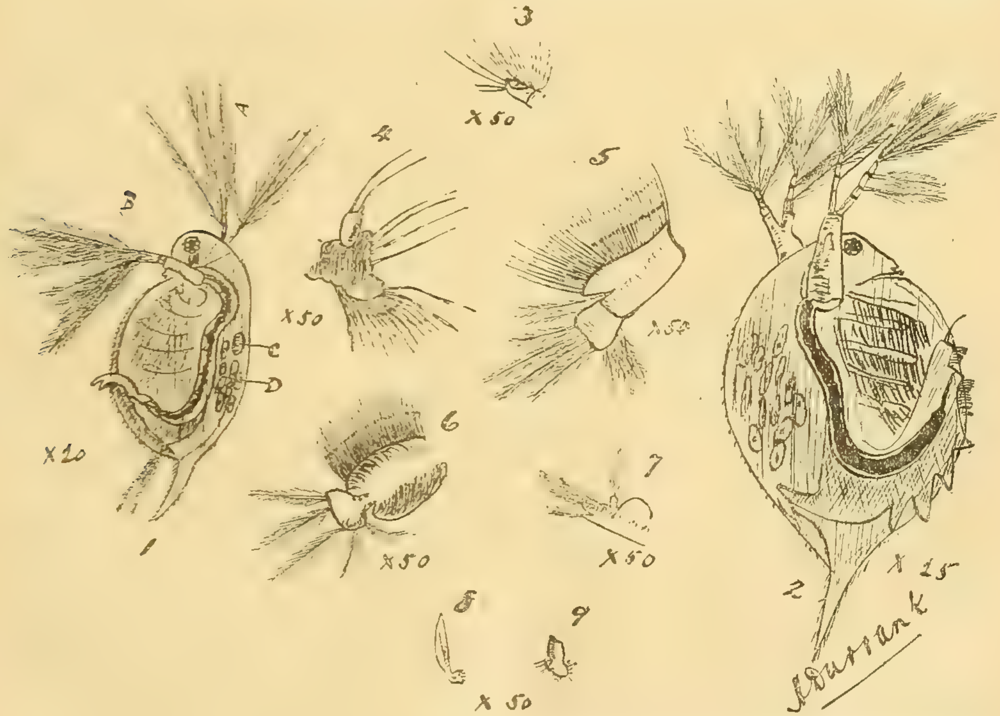


Fig. 147.—1, *Daphnia pulex*: A, inferior antennæ; B, superior antennæ; C, heart; D, ova; 2, *Daphnia Schæfferi*; 3, first pair of legs; 4, second pair of legs; 5, third pair of legs; 6, fourth pair of legs; 7, fifth pair of legs; 8, mandibles; 9, labrum.

and there is a claw at end of second joint. Seta arising from terminal joint long, and floats from underneath carapace. The second, third, and fourth pairs are branchial. Joints with segmented, plumose setæ and a plumose setæ branchial plate. The fifth pair are slightly different to the foregoing. The portion analogous to the branchial plate is rounded and afilamentous.

Life-history.—The interesting feature connected with Daphnia, is the fact that it does not undergo metamorphosis. At their birth the young Daphniæ are as much like their parents externally as they may possibly be, except in size, but after successive moults this is remedied. The ova, on its escape from the ovary, does not leave the shell, but remains directly, only to reappear at the removal of the disliked object.

As in Cyclops, so in Daphnia, one fecundation suffices for many successive generations (some compute it at six, but I believe more); the number of eggs laid varies nearly each time of deposition, for as they advance in life, their number increases from the first deposition of one to, later in life, sixty in some species. It is general that one batch of eggs is restricted to one sex; thus, in a male batch it would be extremely rare to find females, or in a female batch to find males. All moulting and oviposition ceases as the cold weather draws on, and many are of opinion that the frost destroys the creature, leaving the egg unharmed, they hatching out on the return

of spring. But this is not to be taken as the general rule. Daphnia with Cyclops I have frequently taken plentifully in the depth of winter, when the cold has been so intense that the ice of the pool has had to be broken to obtain a dip. The latter I have taken at such times with the external ovaries extended with eggs.

There is another kind of ova, called *Ephippial* or winter ova. This is found in winter, embedded in a thick, opaque substance of a minutely cellular disposition. It occupies the same place as true ova, and its thick covering serves as a defence from the excessive cold. These eggs seem to correspond with the resting-spores of many *Algæ*, *Infusoria*, etc., and according to Lubbock are the *true* ova.

N.B.—In my last communication an over-obliging compositor rendered Jurine, *Jarine* throughout. Readers please correct. Tell this compositor, please, Mr. Editor, that I keep a shot-gun on the premises, and that if I have occasion to come down his way, I shall have sport. I use No. 9 shot.

NOTES ON SPRING PLANTS IN THE GORGE DE CHAUDERON, MONTREUX.

THIS fine cleft in the Lias and Jurassic rock forms a lateral valley from the lake basin of Geneva, through which a succession of cascades descend from a source high up, in the very ribs of the Dent de Jaman; the zone of vegetation from the level of the lake to the head of the ravine is 1300–2500 ft., in the shady part of which the rays of sunshine rarely penetrate.

Early in March the vernal snow-flake appears. It is named *Leucoium vernum* (L.), and somewhat differs from the English summer snow-flake. The flowers are usually each on a separate stem, and the stalk is not winged. The graceful coral-roots quickly follow the snow-flakes, several species here finding a congenial habitat. Of these, *Dentaria pinnata* (Lam.) has leaves with five to nine segments, and *D. digitata* (Lam.) has palmate leaves. The flowers are handsome specimens of Cruciferæ, with white, lilac, or pink petals. The root-scales are an interesting study, each coral-like, angular tooth being proliferous; a modification, in fact, of the bulbous leaf-buds which appear in the axils of the leaves of another species (*D. bulbifera*, L.). I believe Bentham gives this plant as synonymous with *Cardamine bulbifera* of Smith and other botanists, to which reference has been made in the pages of SCIENCE-GOSSIP. Another fine cruciferous plant is freely distributed in the Chauderon, *Lunaria rediviva* (L.), Honesty, standing two to three feet high, with broad, nettle-shaped leaves and terminal lilac flowers. *Ornithogalum nutans* (L.), drooping Star of Bethlehem, is in the moist meadows at the entrance to the gorge in some quantity. *Actæa spicata* (L.), herb Christopher, I here found for the first time, but hardly in flower before the end of May. This is accompanied by the Martagon lily in profusion. *Orobus vernus* (L.) is the first of the vetch tribe to appear, with cluster of flowers crimson, quickly fading to blue. *Chrysosplenium oppositifolium* (L.), the opposite-leaved golden saxifrage, coats the damp rocks with early foliage of delicate green and small yellow flowers. *Sax. cuneifolia* (L.) is readily distinguished through the leaves of the rosette being red at the back, and *Sax. aizoon* (Jacq.) having coriaceous, linear leaves, whitish green and strongly serrated. The round-leaved saxifrage, *Sax. rotundifolia* (L.), is also common. The leaves are soft and downy, the radical ones on a long pedicel; the flowers are white, beautifully spotted with red. *Sax. controversa* (Steenb.), aptly called in French *S. disputée*, I have also noticed, almost identical with *S. tridactylites* (L.), but stronger and more pronounced in all its similar characters. Where water imperceptably trickles down the moss-clothed rock, *Pinguicula vulgaris* (L.), butterwort, and *P. alpina* (L.), grow together, violet and yellow respectively. *Viola hirta* (L.), the hairy violet, is common on the more sunny slopes, of fine growth and colour varying from grey to blue. Of the scented white violets there are two well-marked varieties, *V. alba* (Besser), *V. virescens* (Jord.), with calyx, spur, and leaves uniform pale green, and *V. scotophylla* (Jord.), with those parts tinged with purple. There is the same difference in the capsules. I think the typical dog-violet also occurs, *V. canina* (L.), with large pale blue corolla and white spur. The study of the endless species of the genus Viola is well calculated to turn one's hair grey; their name is legion. *Polygonatium verticillatum* (All.) is, again, a new plant to me; the verticillate leaves and flowers are sessile, and in narrow whorls of four. *Paris quadrifolia* (L.) is abundant. The meadows at the upper end of the gorge are, in May, white with thousands of only too strongly scented *Narcissus poeticus* (L.). From the lake below the fields have the appearance of being still snow-clad. Among the Euphorbiaceæ perhaps *E. dulcis* (L.), is the most striking, distinguished readily by the angular appearance of the bracts of the umbel and its divisions. There is a primrose common to the higher pastures which is not always clearly identified. It is something between the oxlip and ordinary primrose, and described as *P. officinalis* (Jacq.), the mountain primrose. The flowers are pale yellow, and hang in a one-sided, compact umbel. The oxlip flowers are larger, deeper in colour, and have the most irregular umbel straggling all ways. *Trollius Europæus* (L.), the globe-flower, also grows in several of these higher meadows. *Thalictrium aquilegifolium* (L.) occurs here and there in the woods of the ravine. *Arabis turrita* (L.) occupies rocky crevices, with creamy-white flowers, and ample foliage for its kind. *Thlaspi perfoliatum* (L.), and *T. virgatum* (Gren.),

may also be found. *Cornus mascula* (L.) is here a tree, putting forth early and tiny clusters of yellow flowers on every branch. *Coronilla emerus* (L.) is a leguminous shrub with yellow flowers. *Bellidiastrum Michelii* (Cass.), a large daisy, fills the clefts in the rock, with splendid spikes of solidago, *Virga aurea* (L.), which last is in flower almost to Christmas. In the month of May, or in late seasons June, the flora of this accessible ravine is at its best. I note those plants which are most likely to attract attention; but they by no means exhaust the list.

C. PARKINSON.

NOTES ON NEW BOOKS.

THE Migration of Birds, by Charles Dixon (London: Chapman and Hall). We congratulate Mr. Dixon on this, his latest book. He has turned out several good ones, but none more original than the above. Indeed some of the chapters are daringly original. It is now more than twenty years since we ventured to suggest that the northerly and southerly migration of birds in our hemisphere might be connected with the great physical changes in the Glacial Period. Mr. Dixon fairly demonstrates this proposition, and works it out in an admirable manner. The author is a philosopher, as well as a scientist; and he is eminently clear, logical, and terse. Nevertheless his book is charmingly written, and excels in grace and freedom of style. Many years ago, Mr. Dixon made some of his earliest appearances as an ornithological writer in the pages of "SCIENCE-GOSSIP," and we therefore congratulate him on his well-earned success. The present volume runs to three hundred pages, is well bound, and printed in capital type on good paper. It contains twelve chapters, from the titles of which our readers may form a good idea of the extensive ground Mr. Dixon has worked, and of the vast amount of knowledge he has here accumulated. The chapters are as follows:—"Ancient and Modern Views on Migration;" "Glacial Epochs and warm Polar Climates;" "The Philosophy of Migration;" "Routes of Migration;" "Emigration and Evolution;" "Internal Migrations and Local Movements;" "Nomadic Migration;" "The Perils of Migration;" "The Destinations of the Migrants;" "The Spring Migration of Birds;" "The Autumn Migration of Birds;" and "Migration in the British Islands."

Experimental Evolution, by Henry De Varigny, D.Sc. (London: Macmillan & Co.). This is one of the well-known "Nature Series" volumes. Dr. Varigny is a distinguished French Biologist, foremost in the French school of Evolutionists. He has evidently a skilful command of English, insomuch that he was invited to give a course of lectures on the above subject to the summer School of Art and Science in University Hall, Edinburgh, in August of last year. The present volume is the result of those lectures. The literature of evolution has been accumulating for years past, and is doubtless far from being completed. "All the rivers run into the sea, yet is the sea not full," said Solomon. Human life is too short to expend itself in discussion, on a practically accepted principle. The chief value of Professor Varigny's book is its practical side, namely, Experimental Evolution. It is crowded with most interesting facts and experimental details, both in the animal and vegetable kingdoms. It is probable that before long an Experimental Institute will be founded in one of our Universities, on the lines that Professor Varigny here recomends. We cordially recommend this most interesting book to all our readers.

Missouri, Third Annual Report of the Botanical Garden (St. Louis, Mo.: published by the Board of Trustees). The chief value of this handsomely got up annual volume, are two monographs, one by Professor W. Trelease, "Revision of North American Species of *Rumex*, (illustrated by thirty-three highly artistic full-page plates), and Professor Riley's "Yucca Moth and Yucca Pollination" (illustrated by twenty-one plates), both admirable examples of scientific research.

The Fauna and Flora of Gloucestershire, by Chas. A. Witchell and W. Bishop Strugnell (Stroud: printed and published by George H. James, Russell Street). This handsomely got-up work is in every respect—binding, paper, type, and illustrations—a *volume de luxe*. The Editors are thoroughly up to their work, and the list of articles contributed are from the pens of upwards of fifty Gloucestershire Naturalists, each of whom speaks upon his special subject. Each contributor appears to have worked up his subject as thoroughly as possible, and most of them give a short bibliography of papers and articles published by other authors upon them. The Mammalia and Birds of Gloucestershire are particularly well handled, and more fully dealt with (very naturally) than any other division of the Fauna of the county. The descriptions of the reptiles and amphibians occupy twenty-five pages; the fishes sixteen, the crustaceans five, mollusca six, and the ants nineteen. The aculeate hymenoptera are very lengthily dealt with—a somewhat unusual feature—the paper on them running to fifty pages. The article on macro-lepidoptera is richly supplied with lists, which must be of great local value. That part of the book devoted to the Flora of Gloucestershire has two interesting articles on celebrated trees, and celebrated plants. A special paper is given to the local orchids, local ferns, and aquatic plants. There are others on the edible fungi of the county, as well as articles on the mosses, liver-worts, etc., winding up with a valuable catalogue of Gloucestershire plants.

Amid Nature's Realms, a series of zoological, botanical, and geological essays, by Edward Alfred

Martin.—*Glimpses into Nature's Secrets, or Strolls on Beach and Down* (same author), second edition (London: Simpkin, Marshall & Co.). These are two charmingly got up little volumes, illustrated by the author, who evidently possesses an observant eye, and is gifted with a picturesque style of description. The essays are unpretentious—"Sketches," in fact—but this method of public literary presentation well suits Mr. Martin's style. The author is not unknown to the readers of SCIENCE GOSSIP, and the accompanying illustrations of blocks from each of the above books noticed, may be accepted as a fair test of the author's powers as an artist. As a describer of shore and down (what grander kind of Sussex country) we advise our readers to turn to Mr. Martin's books. The essays are accurate, cheery, chippy, and breezy. No man could have written them who had not the smell of the sea and the keen Downs breezes lingering in his nostrils. The only fault we have to find with these pretty books, is that the printers did not place the woodcut illustration the *right* side up!

Report of the Smithsonian Institute, 1890. (Washington, Government Printing Office.). This bulky and well-illustrated volume runs to upwards of eight hundred pages. Most of the articles are re-copied from various scientific journals, and the editors appear to have shown no favouritism in respect to any country. There is one important original paper by William C. Winlock entitled "The Progress of

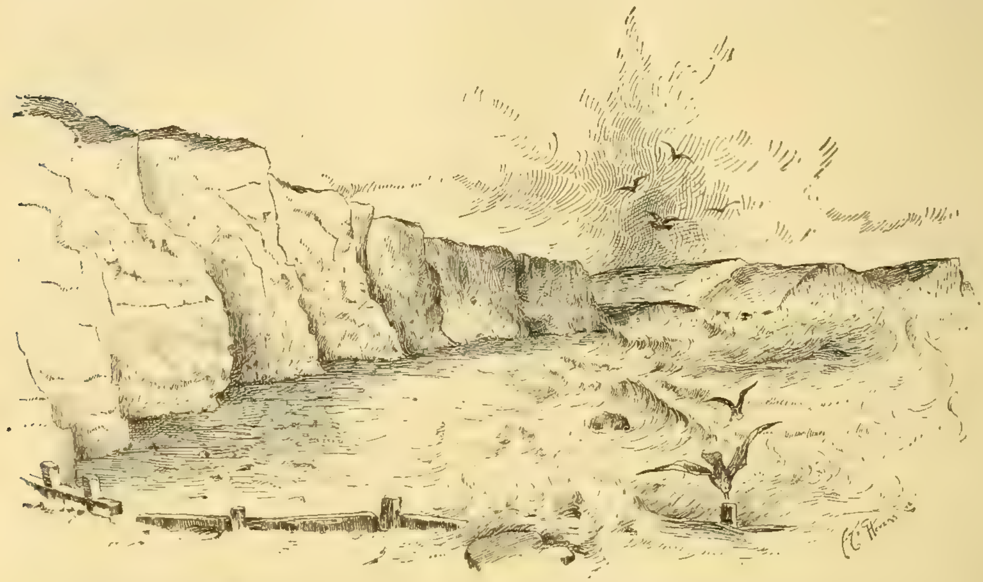


Fig. 148.—Chalk Cliffs between Rottingdean and Newhaven, Sussex. (From Martin's "Nature's Realms.")

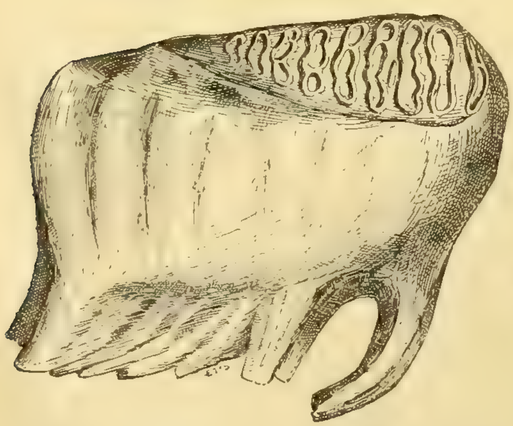


Fig. 149.—Fossil Elephant's Tooth, dredged off Lowestoft, Suffolk. (From Martin's "Nature's Secrets.")

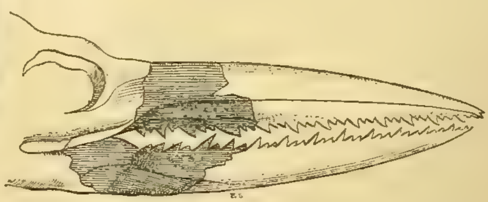


Fig. 150.—Jaw of Fossil Bird, from the London clay. (From "Nature's Realms.")

Astronomy for 1888 and 1890," with a bibliography attached. Other papers are taken from the American and British Association reports, one of the best of which is the "History of the Niagara River," by the well-known Geologist, G. K. Gilbert. Professor Boys' Royal Institution lecture on "Quartz Fibres" is introduced; and many others from English, American, German, and other reviews and magazines.

The Art of Modelling in Clay and Wax, by Thos. C. Simmonds (London: Bemrose & Sons). Mr. Simmonds is the head-master of the Derby School of Art and Technical Institute, and the present admirably written and graphically illustrated little manual is the first of Bemrose's "Technical Series." If its successors are equal to the present example, it will be a very acceptable and valuable little library. We strongly commend Mr. Simmonds' book to all sorts and conditions of our readers.

The Primer of the Art of Massage (for Learners), by Dr. Stretch Dowse (Bristol: John Wright & Co), is a little book which ought to be welcomed. *Massage* is now much practised, and is as useful, if not as important, as "Ambulance." It is well and clearly written, and sufficiently illustrated by original sketches. Dr. Dowse's book is an eminently useful one.

Wood-Carving, with Suggestions on Chip-Carving, by Thomas C. Simmonds (London: Bemrose & Sons). Another of Mr. Simmonds vigorously and clearly described shilling handbooks, illustrated with a vigour and force that must make them "take" with students. It is the best, cheapest, and most instructive work of its kind now before the public.

Handbook for Essex, Suffolk, Norfolk, and Cambridgeshire, third edition, carefully revised, with maps and plans (London: John Murray). Murray's famous Handbooks are known everywhere, but we question if a more altogether unique and interesting district could be dealt with than these four eastern counties. As far as possible the rich storehouse of historic and ecclesiastical archæology, has been efficiently dealt with and brought up to date. The geology, botany, zoology, etc., have also been as carefully revised, as the Editor of SCIENCE-GOSSIP (to whom they were entrusted) could possibly undertake.

Beneath Helvellyn's Shade, by Samuel Barber (London: Elliot Stock). Many of our readers will remember this writer's illustrated contributions on Clouds in past numbers of SCIENCE-GOSSIP. He is a man of acknowledged eminence in the science of meteorology, and especially in the department of cloudland. For several years Mr. Barber has been curate at "Wythburn's lowly house of prayer," as Wordsworth calls it—the picturesque little white-washed church on Dunmael Raise, at the foot of grand Helvellyn, in the country which Hall Caine has made so famous in his "History of a Crime." Mr. Barber is a man of strong natural history tastes and keen habits of observation; he is also a man of sym-

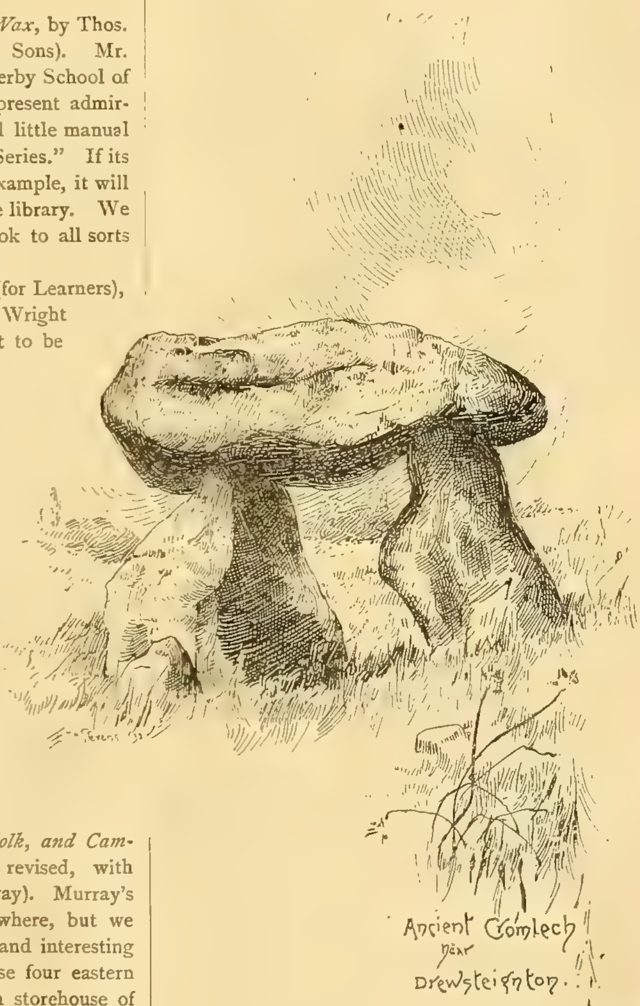


Fig. 151.—(From "Nature's Realms.")

pathetic nature, and gifted with good literary tastes. He can hardly have gone anywhere to have better studied the birth, life, and death of clouds, or the habits of wild mountain-birds, or the strange tricks of glacial geology. His charming little book includes all these subjects, as well as notes on the folk-lore, habits, and customs of the natives, local archæology, etc; and three valuable chapters on clouds. It is an eminently readable little book, which we strongly recommend.

WOODLAND WANDERERS, OR THE MYCETOZOA.

NOT that our woods and shady coppices are the only haunts of the strange creatures designated above, but these are their homes *par excellence*. Wherever there are shade and moisture, associated with decaying vegetation, there will these curious and interesting organisms almost certainly exist. To find them is quite another matter, as unless one's attention is directed to them, these singular creatures will probably be overlooked. The appellations, organisms and creatures, are used advisedly, as it is still a moot question amongst scientists, whether they belong to the animal or vegetable kingdom. For years a battle royal has been waged amongst specialists in this department of scientific investigation, as to their position in classification, and it may be assumed that a final judgment has not yet been given. Nevertheless every original observer has a right to an opinion, which should be unbiassed, and based upon extended data; and if one may judge upon the fact that in the mature condition these organisms produce capsules containing spores, it would seem that they should be classed with the vegetable kingdom.

But this tendency (or shall one call it rage?) for exact classification, for arranging every known form of life in a linear series, may possibly be carried to an absurd length. For if there be any truth in the assumption that all the creatures that inhabit the earth, have descended from some few primordial forms of life, it will readily be granted that the two great kingdoms of animated nature may touch at numerous points; that here and there they coalesce or diverge, and that there may be existences that combine some of the features of both. To these we may surely relegate the subjects of this paper. They have at least three well-defined stages of existence, the distributive in the form of minute spores, myriads of which are borne as impalpable dust by the country breezes; the creeping stage, when for an indefinite period, it may be weeks or months, numbers of these spores, having thrown off their cell-coverings, coalesce, and creep about on decayed leaves or in dead wood; and the mature stage, in which, having ceased their wanderings, they become sessile, and produce capsules. From this it will be seen that they exhibit the curious phenomena of alternation of generations; that is, that like does not produce like, but that in a series of phases of existence, the first and third, and the second and fourth are alike. Possibly this may not be regarded by some as an instance of true alternation of generations, but it at least presents close analogies to this phenomenon.

It is the creeping stage, however, which has the greatest fascination for an observer, as it is both curious and singular. It was only after many months of patient investigation that we were rewarded by the discovery of a mass of this substance. The *we* is not editorial, but covers two personalities, a juvenile enthusiast still in his teens, and the writer, the latter often finding material assistance from the sharp vision of his more youthful coadjutor. On the occasion referred to, we had just reached the edge of an opening in a damp wood; lying near us was a large trunk of an oak, which, having been felled many years ago, was not only saturated with moisture, but was thoroughly decayed. Overshadowing it were tall fronds of bracken, and straggling sprays of bramble. Running our eyes along its rugged bark, adorned here and there with mosses and fungi, we were gratified to see yellow veins of a substance unlike anything we had before seen. It covered a space over a foot in length and several inches in breadth. It was somewhat viscid, distributed in anastomosing veins, some minute, and others a quarter of an inch wide, and sometimes spread out into fan-shaped figures towards the margins of the mass. So slight was its adhesion to the bark, that a worm was seen to crawl between the two; it was probably one of those worms that affect decayed wood, about which Mr. Hilderic Friend writes so graphically. We knew almost intuitively that it was what we had so long sought, namely the the plasmodium of a Mycetozoon. The term plasmodium is that by which the creeping stage of these creatures is designated. Aften carefully examining it, looking at it in every respect, noting its dimensions and general appearance, we took off a portion with plenty of the underlying decayed wood, so as to observe it at home at our leisure. After crawling about the wood for four or five days, the granular contents contracted into small protuberances in the veins; the following day these changed into minute capsules, which eventually became greyish-white, and filled with dark spores.

Having thus once found plasmodium, it was singular that one had little difficulty in finding it in other places afterwards. A small specimen of an allied species to the one mentioned above, was attached to a piece of wood that lay in contact with a larger one, but only by a narrow strip about a quarter of an inch wide. The plasmodium used this strip as a bridge, and by a single sinuous vein, nearly the whole of it passed over to the larger piece of wood. After having spread out on its surface and absorbed what food was available, it crept back again to its original position, and eventually formed its fruit. On another occasion a small quantity of greenish-yellow plasmodium was found attached to the under side of a small rotten branch, and it is expedient to examine the under side of fallen branches, as these creatures appear to avoid light. This was placed under observation for several days, after which it mysteriously disappeared, its former position being marked by slimy tracks. One of us thought it was dead, but the juvenile observer hoped it had only crept into the wood. This was really the case, for after a few days it came out of its concealment, and formed a delicate

group of fruits of a golden-yellow hue. The circumstance is note-worthy, inasmuch as it proved to be a rare species of which the plasmodium stage was previously unknown to scientists.

Yet another instance of the peculiar habits of these organisms. Two small masses of plasmodium had been under observation for several weeks, and it was thought they did not seem healthy, possibly wanting a change of diet. Accordingly a fungus, one of the polyporous group, was soaked in water, divided in halves, and a portion placed near each. Both of the plasmodia crept from their positions, and crawled over the respective portions of supposed aliment. Unfortunately it was the last journey for each of them, for either from the detrimental qualities of the fungus, or from acarites that may have infested them, both plasmodia perished, after two or three days of evident decadence.

JAS. SAUNDERS.

Luton.

(*To be continued.*)

ON THE UNDERGROUND GEOLOGY OF LONDON.

By EDWARD A. MARTIN,
Author of "Glimpses into Nature's Secrets," etc.

THERE are few subjects of geological interest which have a greater fascination for the theorising student, than the subject of the position which the various geological strata have, and the directions which they take, under our great metropolis.

Almost all the information which we possess as to the bearings of these underground strata, have been obtained from borings which have been made in search of water. Thus, when the object of the boring has been achieved, or when on the other hand its failure has become an established fact, the prosecution of the work has been stopped, and the geologist has been left to wander in the field of speculation as to what kind of strata would next have been met with deeper down.

We have then a limited number of borings, from whose data we are able to speculate, and from these we are able to form a general opinion, although not a very definite one, as to the contour of the underground palæozoic land-surface, which has been shown to exist by such geologists as De la Bêche, Godwin-Austen, and Prestwich.

To get a clear understanding of the depths in the borings at which various strata have been met, and of the superficial distance at which the sites of the borings stand in relation to one another, the accompanying diagrams have been prepared which may perhaps help to attain this object, and in view of discoveries which have been made of coal in our south-eastern counties, and of possible results which may be obtained in connection with borings now in course of being carried out, it is necessary that the knowledge already obtained should be understood.

The positions of certain of the borings appear to stand in relation to one another in general northerly and southerly direction. Commencing beyond the northern limits of the metropolis, at the boring made at Ware, in Herts, and pursuing a southerly direction, we come to that made at Turnford, after which follow those at Kentish Town, Tottenham Court Road (Meux's), Streatham, and the Caterham Waterworks. From these we have data from six borings, all more or less in a line north and south of one another.

At Ware the base of the chalk was met with at a depth of 558 ft., at Turnford 784 ft., at Kentish Town 969½ ft., at Meux's 814 ft., at Streatham 864 ft. and at Caterham Works, at 458 ft. The upper greensand and gault clay were met with regularly throughout the whole distance, although each of these slightly thinned immediately under central London. So far no difficulty was encountered in deducing the underground contour of the strata from the facts furnished. But beneath the gault, the strata met with were as varied as they could well be.

One of the most recent surprises was the discovery of the complete thinning out of the lower greensand beds beneath London. At Ware, on the north, these beds had already almost disappeared, there remaining but a foot of strata, which have been doubtfully classed as belonging to this series. On the south, when the Southwark and Vauxhall Water Company made their boring at Streatham, in order to tap the supply of lower greensand water at that place, it was discovered that these strata had ceased to exist, and that they had already completely thinned out at some point between Streatham and the escarpment of the North Downs. These two facts therefore enable us to construct our diagram so far with certainty.

One leading fact stands out in connection with the boring at Ware, which gives us there a secure footing from which to start our deductions as regards the more ancient rocks. Strata which were unmistakably recognisable as of Silurian age were there met with at a depth of 796 ft. Now, since at Turnford, only eight miles south, beds of cretaceous age continued as deep as 980½ ft., it was evident that between these two places there must have been a very sudden dip in the strata, in order to allow of comparatively recent beds to be met with nearly two hundred feet deeper at the latter place, than the older beds at the former place. The dip too must be greater than this alone would imply, for although no Devonian beds were found above the Silurians at Ware, these actually appear at Turnford, immediately beneath the gault clay (cretaceous). The boring was only carried 29½ ft. into the Devonian rocks, so that we are at present in the dark as to the depth at which

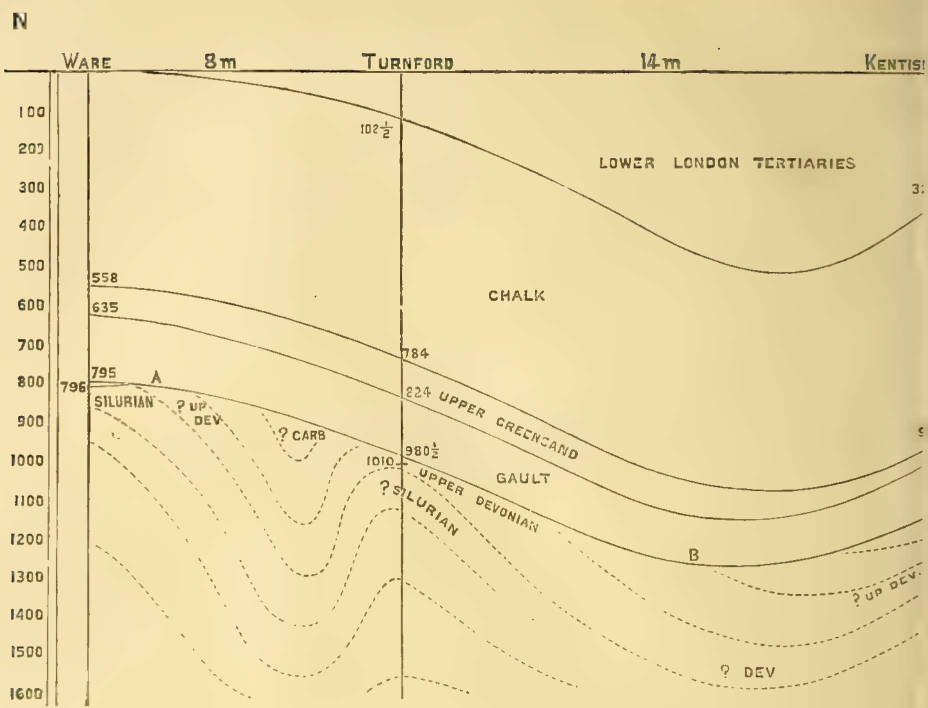


Fig. 152.—Scale: horizontal, ¼ in.

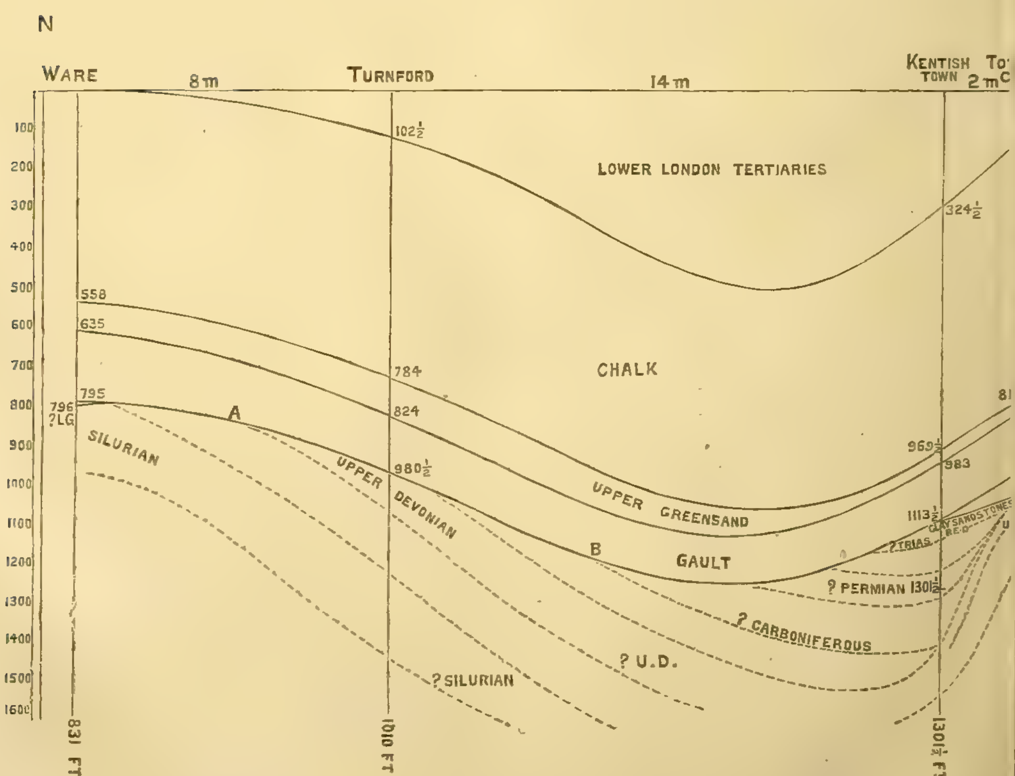
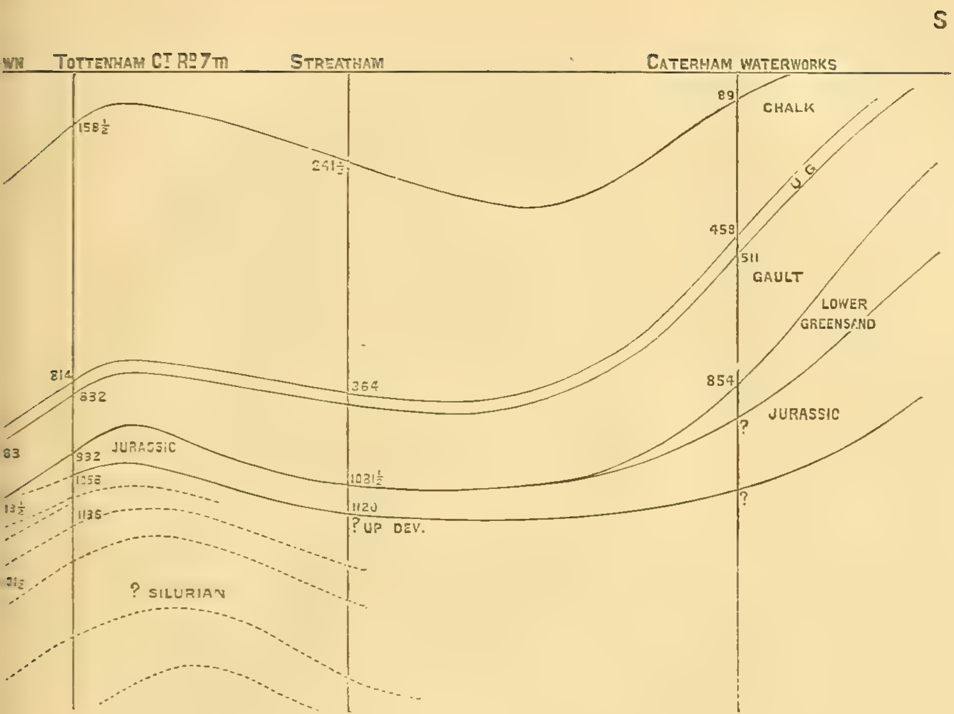
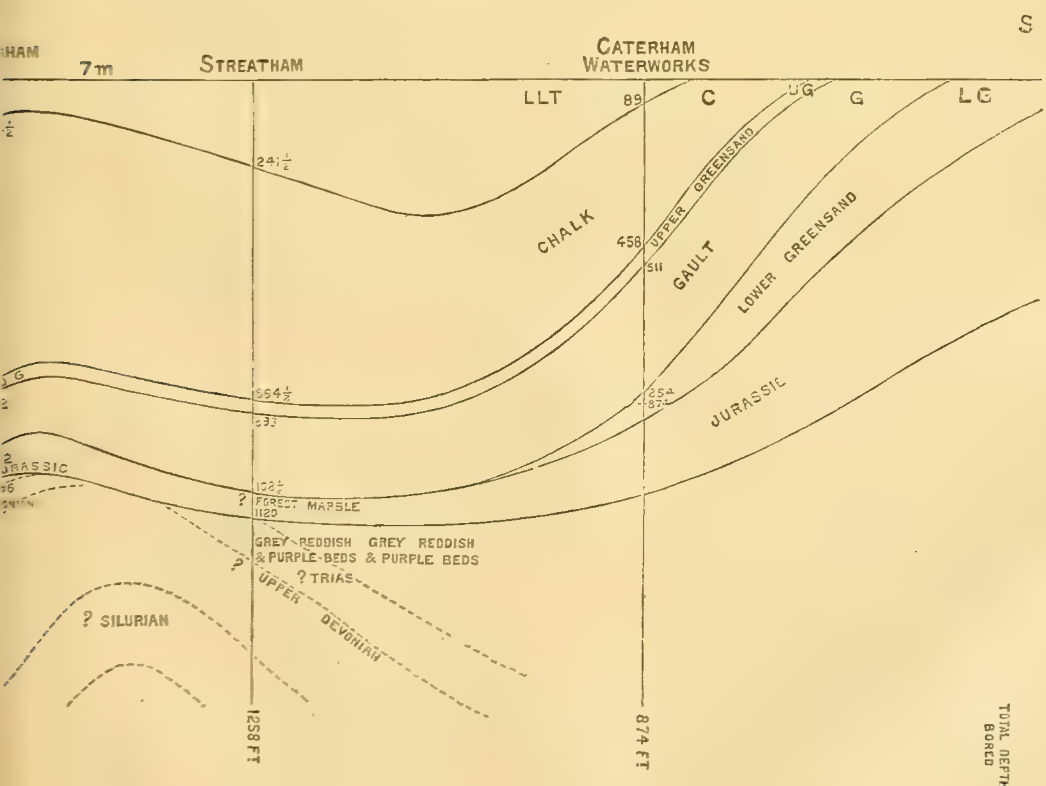


Fig. 153.—Scale: horizontal, ¼ in.



to mile; vertical, ¼ in. to 100 ft.



to mile; vertical, ¼ in. to 100 ft.

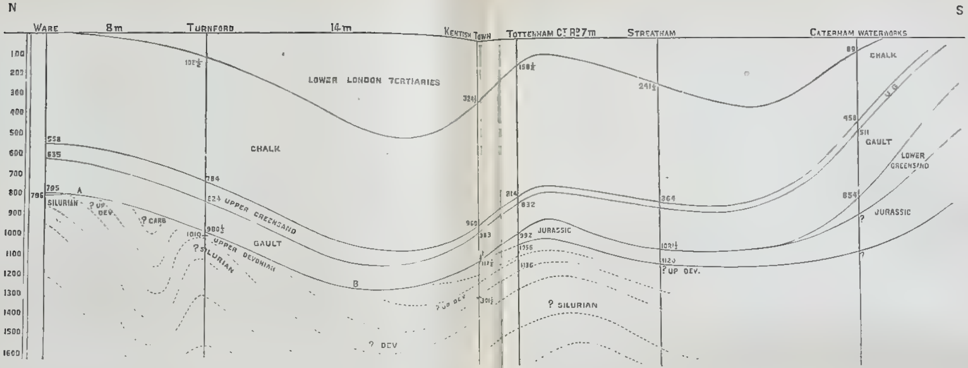


Fig. 152.—Scale: horizontal, ¼ in. to mile; vertical, ¼ in. to 100 ft.

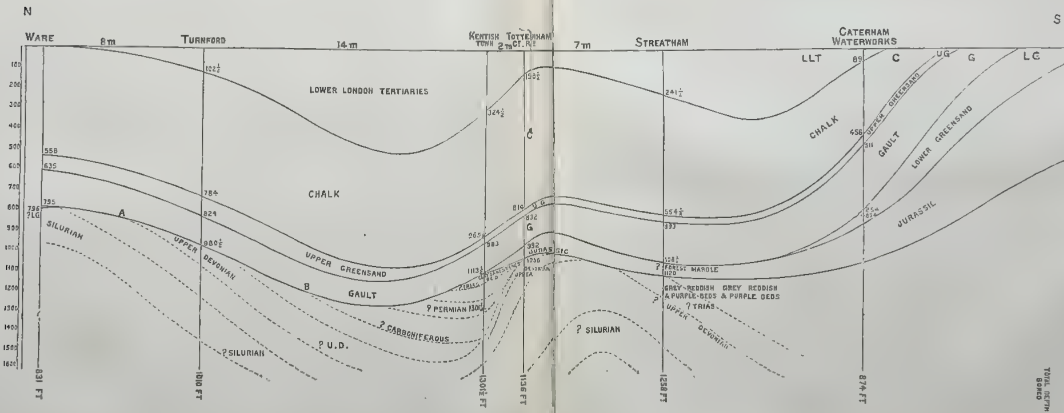


Fig. 153.—Scale: horizontal, ¼ in. to mile; vertical, ¼ in. to 100 ft.

Silurians might have been encountered there. We are therefore right in assuming that the Devonians have thinned out at some point between the two borings, as A in the diagram.

If we continue the angle of dip along the base of the gault, supposing the strata to remain regular at this angle of dip, we should probably not have to proceed many miles before arriving at carboniferous strata, outcropping, perhaps as at B. Whether such strata would actually contain coal could only be ascertained by experiment, since possibly the denudation of the palæozoic land-surface which took place prior to the deposition of cretaceous beds, may have swept away in this particular place all traces of coal-measures.

In two of the three important borings which follow, the precise age of the deepest-seated rocks has not been satisfactorily determined.

Beneath the gault, beds of Jurassic age have been met in the borings at Meux's and at Streatham, at a depth of 992 ft. in the former case, and at 1081½ ft. in the latter. Meux's boring has also furnished undoubted upper Devonian rocks at 1056 ft. This must respresent a rise of these rocks out of the trough into which they were seen to be sinking between Ware and Turnford, and which probably continued beneath the Kentish Town boring.

At the Kentish Town, and Streatham borings, beds which have been classified in Mr. Whitaker's work on the geology of London as marl, red sandstones, clay, etc., were bored into at depths of 1113½ ft., and 1120 ft., respectively. Now the unsettled question about these is, are they also Devonian, or may they be classed as new red sandstone or an abnormal condition of any other series of strata? It is certain that they are not of more recent age than Jurassic, since at Streatham there is a thickness of 38½ ft. of Jurassic beds above them, and this narrows considerably the question to be decided. They were doubtfully classed when first discovered, and have remained in doubt ever since, and we shall probably have to wait a further boring somewhere nearer the river, before a final decision is ventured upon. If we consider the beds in both cases to belong to the triassic series (new red sandstone), the strata may possibly have a trend as shown in Fig. 153. There can be no doubt that since the deposition of the cretaceous beds there has been a considerable crumpling of the earth's crust, and in order to allow of the chalk reaching so near the surface as it does at Meux's Brewery. Whatever contortion and denudation the ancient palæozoic beds may have undergone previously, they must also have partaken in the post-cretaceous flexures, which may very possibly have brought about the position shown as the position of these beds in the diagram, if regarded as of triassic age. The position of the doubtful beds in the Streatham boring would be easy of explanation, in fact, here it would matter little if they eventually proved to be Devonian, as we have no evidence as to where the Devonian dips again into a trough, and it is only fair to say that they as much resemble the one formation as the other.

But, supposing on the other hand, the red clay and sandstones in the Kentish Town boring are decided to be Devonian also, the palæozoic beds would then appear to present much the same contortion as the more recent secondary beds. As, however, the older beds, when they appear at the surface in the coal-producing areas at home and abroad, appear to have been contorted and subsequently denuded so as to leave them in isolated basins, as they may be termed, separated, as Godwin-Austen has pointed out, by intermediate areas exhibiting the outcrops of still more ancient rocks, we can scarcely expect that the position and shape of the cretaceous beds above is closely imitated by the Devonians beneath, and for this reason alone we should hesitate to class the rocks in question as Devonian, unless they are decided to be so from petrological or palæontological reasons. The alternative being that they are of triassic age, it should be pointed out that the position they must then necessarily occupy would agree with preconceived opinions as to the contortion and denudation of the palæozoic land-surface previous to the deposition of the secondaries.

In a distance such as that between Turnford (Cheshunt) and Kentish Town, one cannot tell what may happen in the configuration of these ancient strata. Mr. Whitaker has pointed out that even between Ware and Turnford, it is quite possible that a trough may occur such as that shown in Fig. 152, by means of which a patch of carboniferous strata may still remain, which has since been unconformably covered by the gault. Such a dip, however, is not at present shown by any knowledge which has been actually obtained. It illustrates, however, how carboniferous beds might possibly be met with, either here or perhaps beyond the Streatham boring, a region where the ancient rocks have not at present been bored into.

In referring to the accompanying diagrams it must not of course, be overlooked that the scale used is one which exaggerates tremendously the depth of the strata in proportion to the extent of surface shown. A true representation would be secured were the horizontal distance multiplied about fifty-three times, but this is obviously impossible in the case of a simple diagram.

COPPER and German silver wire ·002 inch in diameter, of which it takes ten miles to weigh a pound, is used in the delicate receiving instrument for ocean cables, testing galvanometers, etc. Small as the wire is, it is wound with two layers of silk thread smaller in diameter than the wire. The wire is made by drawing through drilled diamonds.

THE ENDEMIC FEATURES OF THE BRITISH SLUG-FAUNA.

By T. D. A. COCKERELL. F.Z.S., F.E.S.

DR. A. R. WALLACE, in "Island Life" (2nd ed., Part ii., chap. xvi.) gives a very interesting discussion of the British fauna and flora, in which he argues, contrary to the opinion of many, that there really are numerous species and varieties in our islands which are truly peculiar to them, either having arisen within our area, or else been formerly more widely distributed, but now surviving only in Britain.

In discussing a question of this kind, we need very full information as to the foreign species and varieties, and this, unfortunately, is not usually in the possession of British students; while foreigners, as a rule, are not well-acquainted with our supposed endemic forms. It happens, however, that of late years the slugs and their variations have received special attention at the hands of several naturalists, and some very full and elaborate works have appeared, giving us much of the desired information. The slugs, also, being extremely prone to vary, and slow to migrate, are specially suitable for illustrating the points at issue.

The following notes have accordingly been put together, constituting an examination of the forty-four varieties and mutations which have been first described from British specimens. There are a few still unnamed forms not mentioned, as it seems best, for purposes of comparison, to include only those which have been named and listed. It seems unnecessary to give full bibliographical references; but it may be remarked that no names are herein published for the first time.

The objection is almost sure to be raised, that many of the forms are of no interest, being merely individual mutations. From the view that such are unimportant, I entirely dissent; and it may be pointed out, that such mutations are very frequently, perhaps more often than not, restricted to one portion of the range of the species. Take for example the var. *albolateralis* of *Arion ater*. Over the greater part of the range of the species it does not occur at all; in parts of Britain it is a rare aberration or mutation, while in certain districts it becomes a distinct and common variety. So also with *Agriolimax agrestis*, var. *niger*, and many others. It is the greatest mistake to suppose that any species shows the same kind and amount of variability in every part of its range, unless, indeed, that range is extremely limited.

TESTACELLA (Cuv.).

1. *T. scutulum*, mut. *pallida*, Ckll., pale yellow without markings. Chiswick, with the next. A similar mutation (*flavescens*, Moq.) of *T. haliotidea* is known on the continent.

2. *T. scutulum*, mut. *aurea*, Ckll., mottled with brown, but the sole vivid orange. *T. bisulcata*, Risso, which differs hardly at all from *scutulum*, varies towards orange in France. *T. maugei* has a variety (*viridans*, Morelet) with a brilliant orange foot, found in Portugal and, according to Mr. Roebuck, in Co. Waterford, Ireland.

LIMAX (L.).

3. *L. maximus*, mut. *lilacinus*, Roeb. Like mut. *krynickii* Kal., as to markings, but the ground-colour clear lilac. Found at Stroud, Gloucestershire. Interesting, as showing a tendency towards the brighter colours observed in the same species further south. Baudon records a variety *vinosa* from France; and the reddish var. *rufescens*, Moq., first described from France, has been taken in Britain. *Agriolimax agrestis* varies in a similar way, from the grey type, to reddish (mut. *rufescens*, L. and P.) and violaceous (mut. *lilacinus*, Moq.) forms, both of which occur in England as well as on the continent; the latter is found in the same district as the lilac form of *L. maximus*.

4. *L. maximus*, mut. *cinereus*, Roeb. (non Moq.). This is ashy, unicolorous, with the mantle blackish, and is reported from various localities, including four Scottish counties (Roebuck). It was supposed to be the same as var. *cinereus* of Moquin-Tandon (1855), but that is equivalent to Müller's *cinereus*, var. *a*, which is doubtless *L. cinereo-niger*. Férussac ("Hist. Nat. Moll.," Pl. iv. f. 1) figured this same *cinereus*, var. *a*, as is noticed by Moquin-Tandon; and the var. *ferussackii* (sic) of Kaleniczenko (1851), was intended to include the form depicted by Férussac.*

The British form of *L. maximus*, which has been called *cinereus*, probably does not differ from similarly-coloured slugs which occur on the continent. O. F. Müller ("Verm. Hist." 1774. vol. ii. p. 7) described a variety as ashy, with a white border and sole; this, in 1855, was named *limbatus* by Moquin-Tandon. Heynemann ("Mal. Blätt.," 1862, p. 55) gave the name *unicolor* to an almost identical form, which is now known from Germany, Italy, and Sicily. Lessona and Pollonera ("Mon. Limac. Ital.," 1882) call it a species, *L. unicolor*, with four varieties. These are really all suffused or melanic forms, such as occur in many species of slugs. With the same group, but less melanic, are the mutations known as *obscurus*, Moq., and *nebulosus*, D. and M.; these are both British and continental.

5. *L. maximus*, mut. *marmoratus*, Ckll. Found at Chislehurst, Chiswick, and Bath; closely allied to mut. *krynickii*, but the mantle is beautifully marbled,

* Kaleniczenko's *razoumowskii* and *renardii*, described as varieties of *L. antiquorum*, are also forms of *L. cinereo-niger*; but his *czernævii* and *krynickii* belong to *L. maximus*. The var. *czernævii* may be taken as equivalent to Moquin-Tandon's *vulgaris*, over which it has priority, although it was intended to include forms now referred to *cellarius* as well. *Fasciatus*, Pic. (1840), a still earlier name for the same, must apparently fall, as there is a different mut. *fasciatus*, Raz. (1789).

and the body has grey bands and *scattered* dark spots. A nearly identical mutation was found among an introduced colong at Newport, U.S.A., and is figured by Mr. W. G. Binney, "Man. Amer. Land Shells" (1885), p. 450.

6. *L. maximus*, var. *pallido-dorsalis*, Roeb. M.S., Hudson. The name was published, without any description, in SCIENCE GOSSIP, 1885, p. 67. In "Journ. of Conch." 1886, p. 48, the slug is described, though without citing the name. It was found at Wilton Woods, Lower Tees, in several stages of growth, and apparently represents a well-defined local variety, approaching *cinereo-niger* somewhat in its coloration.

7. *L. marginatus*, var. *maculatus*, Roeb. A beautiful variety, spotted with black, which occurs frequently in parts of Ireland; Mr. Delap sent me specimens from near Clonmel, and Roebuck records it from Co. Mayo. This must be regarded as a distinct Irish race, nothing that could be considered identical has been found either in Great Britain or on the continent, and it is such a striking form that it could not easily be overlooked.

8. *L. marginatus*, mut. *submaculatus*, Ckll. Merely a form of *maculatus*, in which the spots are mostly grey, and partly coalesce, thus forming a transition towards the type. Found in Co. Waterford.

9. *L. marginatus*, mut. *decipiens*, Ckll. A form with pale spots, of special interest as simulating the normal markings of the allied *L. flavus*. It has been found more than once in Ireland, and there is a not very characteristic specimen from near Norwich in the British Museum. I know of no continental record, but it is very possible that the var. *albo-maculatus* of Kreglinger ("Syst. Verz. Deutchl. Binn. Moll.," 1870) is nearly or quite identical.

10. *L. flavus*, mut. *suffusus*, Roeb. Uniformly dark yellowish-grey, without markings; mantle tinged with yellow anteriorly; sole yellowish-white. The only example I have seen is the type of the variety, and was found by my brother at Ealing. It might be mistaken for one of the suffused forms of *L. maximus*, were it not for the colour of the tentacles. No similar form appears to exist on the continent, except that in the Caucasus there is a unicolorous race named by Boettger (1881), *L. ecarinatus*. According to Simroth ("Nachsch. Port.-Azor. Faun.," 1891, p. 308) the Australian form *breckworthianus*, Lehm., is also similar. May it not be that the latter is a case of atavism, induced by changed conditions at the Antipodes?

11. *L. flavus*, mut. *griseus*, Roeb. Like the type, except that the ground-colour is grey, and there is little or none of the yellow mucus which covers typical examples. First found at Bath, and since then occasionally elsewhere, as far north as Renfrew, Scotland. Not observed on the continent, but *umbrosus*, Phil. (1844), may be somewhat similar.

12. *L. flavus*, mut. *antiquorum*, (Sowerby, "Gen. of Shells," vol. ii. pl. 158). An ochreous form, with obscure markings, and the interstices of the dorsal rugæ dark, producing a finely reticulate effect. There is a large specimen from Chobham (Mus. Leach) in the British Museum. The mut. *flavescens*, Fér., found on the continent, is very similar.

13. *L. flavus*, var. *lineolatus*, Collinge. Found in Oxfordshire, and very different from any variety of *flavus* known elsewhere. It has yellowish tentacles and a dark brown line down each side of the body: I should suppose, judging from the description, that it was better referable to *L. marginatus*, but Mr. Collinge assures me that this is not the case.

AGRIOLIMAX (Mörch.).

14. *A. agrestis*, mut. *filans* (Hoy, 1791), Auctt. Greyish-white with the mantle yellowish. This is one of the ordinary mutations of *agrestis*, recorded from as far north as Forfar, in Scotland (Roebuck), and south to Italy (Lessona and Pollonera).*

15. *A. agrestis*, mut. *niger*, Butterell. This is a very interesting black variety, first found in Yorkshire, where it seems to be locally common. I have received it, together with the forms *tristis*, *obscurus*, and *sylvaticus*, from Wakefield (J. Wilcock). I have never met with it in the south of England, but it is recorded (SCIENCE GOSSIP, 1884, p. 78) from Gloucestershire. It is also found in two Scotch counties, Wigtown and Haddington (Roebuck, 1891), but apparently not in Ireland. It is quite unknown on the continent, but Simroth found it above the zone of cultivation in the Azores. In Sicily and Crete there is a somewhat similar variety (*panormitanus*, Less. and Poll.), which, however, has a rather differently formed keel on the body, and is said to differ in other minor points of structure.

16. *A. agrestis*, mut. *griseus*, Ckll. Entirely dark greyish; first found in Lancashire. Dr. Scharff figures a specimen from Co. Dublin, Ireland. This is a partly melanic form, similar to *L. flavus*, mut. *suffusus*, and has not been recorded from the continent so far as I am aware.

17. *A. agrestis*, mut. *albus*, Ckll. Pure white; an albino form. Found occasionally in England, and Dr. Scharff ("The Slugs of Ireland," p. 527) records an example from Raheny, Ireland. Mr. F. R. Latchford informs me of a "milk-white" form of *agrestis* found at Ottawa, Canada, which is presumably *albus*. I have no record from the continent, but it probably occurs there; the var. *albidus*, Picard, Moq.-Tand., with which it is frequently confounded, is different.

18. *A. agrestis*, mut. *submaculatus*, Wllms. A

* At Parkstone, in Dorset, I have found an allied mutation, with pale ochreous-brown spots on the mantle, and greyish spots on the body; tentacles pale brown. The tendency in this and *filans* for the mantle to have a warmer coloration than the body, is interesting.

mutation recorded from Stourport, very similar in colour to the Italian var. *florentinus*, Less. and Poll.

19. *A. lævis*, mut. *maculatus*, Ckll. A spotted mutation, first described from Surrey, but probably common in many places both in England and abroad. No spotted form is recorded in Dr. Scharff's "Slugs of Ireland;" but the Italian type, as described by Lessona and Pollonera, is spotted. In various parts of the world are found slugs very closely allied to *lævis*, and these are often spotted. *A. campestris*, Binn., of the United States, is described as without spots or markings, but Mr. W. G. Binney sent me a mottled form from Burlington, New Jersey; and a dark variety sent by Mr. R. E. C. Stearns from Washington, D.C., has the mantle mottled. In the race *montanus*, Ingersoll, from the Rocky Mountains, the mottling is obscure or obsolete, and so also with the race *hyperboreus*, Westerl., from the Pacific Coast; but the *A. berendti*, S. and P., found further south, has a var. *pictus*, Ckll., from Lower California, in which the mantle is spotted and blotched with black. In Bermuda and Jamaica is found a variety of *A. campestris*, in which the mantle is marbled.

AMALIA (Moq.).

20. *A. gagates*, var. *rava*, Wllms. A drab-coloured race of the northern subsp. *plumbea*, Moq. Found in the west of England, and also recorded from Middlesex ("J. of Conch.," 1891, p. 398), and figured from an Irish specimen by Scharff. Not noticed on the continent, but the mut. *olivacea*, Moq., found in France and Italy is very similar, and no doubt intergrades with it.

21, 22, 23, 24. *A. Sowerbyi*, var. *nigrescens*, Roeb., mut. *rustica*, Roeb., mut. *fuscocarinata*, Ckll., and mut. *bicolor*, Ckll. Concerning these see "An. Mag. N. Hist.," Oct. 1890, p. 284; to the account there given may be added, that var. *nigrescens* does not always lack the internal shell, and that mut. *rustica* is from Gloucestershire. Of these forms, none of which are known from the continent, *bicolor* has strong contrasting black and orange colours; while *fuscocarinata* is quite the reverse, being of the typical brown, without even the keel differently coloured. Mut. *rustica* is grey, analogous to the mut. *griseus* of *L. flavus*; and var. *nigrescens* is strongly melanic. The last, from the London district, comes nearest to being a distinct race.

ARION (Fér.).

25, 26, 27. *A. ater*, mut. *brunneopallescens*, Roeb.; mut. *luteopallescens*, Roeb.; and mut. *fuscolutescens*, Ckll. These are best considered subvarieties of Moquin-Tandon's *pallescens*, which is found in France. This grades into the form known as *succineus*, with varying shades of colour, apparently of no great importance. I formerly considered *fuscolutescens* identical with a variety described by Baron Paiva from Madeira, but it is possible that his slug may really have belonged to *A. lusitanicus*, Mab., which, according to Simroth, inhabits that island.

Taking the pale yellowish and brownish varieties of *A. ater* altogether, their distribution presents features of interest. Dr. Scharff does not seem to have met with them at all in Ireland ("Slugs of Ireland," p. 537). In Scotland they seem to be rare, as Roebuck ("Proc. Roy. Phys. Soc.," 1891) records var. *pallescens* from only two counties, and var. *succineus* from only two, while the blackish form *nigrescens* is recorded from seven, and the dark brown *brunnea* from four. In England, at least in the south-east, they become frequent; Dr. Leach ("Moll. of G. B.," 1820, p. 67) included them under his var. 5, which he said was confined to chalky districts, mentioning especially the neighbourhood of Dartford.

28. *A. ater*, var. *albolateralis*, Roeb. Back black, sides white, the two colours sharply defined from one another; foot-fringe orange. A most beautiful and remarkable variety, characteristic of North Wales and the Isle of Man, but not known, so far as I can learn, from the continent. Had it occurred out of our islands, it could hardly have escaped notice.* In Ireland it seems to be unknown; although Dr. Scharff records a form "black with yellow sides," which, however, must be considered nearer to var. *bicolor*, Moq., than to *albolateralis*. In Scotland it has been recorded by Roebuck from Sutherland.†

29. 30, 31. *A. ater*, mut. *plumbeus*, Roeb.; mut. *seminiger*, Ckll. and mut. *cinerascens*, Ckll. (= *cinerea* Roeb., not Westerl.). These are merely dark mutations, the first lead-colour with the margin dull yellow, the second with a dark brown mantle and black body, and the third very dark slate, with a dark brown margin. They may be regarded as forms of *razoumowskii* (Kal.), which is well known both in Britain and on the continent. The form *plumbea* is on record for England, Scotland, and Ireland; but the other two only for England.

32. *A. ater*, mut. *brunneus*, Roel. Simply a dark brown mutation of the widely-spread var. *rufus* (Linn.), but interesting, as showing the tendency of the British forms to become dark. There seems to be every gradation between the bright red form *lamarckii* (Kal.) and the dark brown *brunneus*, but while the bright red slug, so common in many parts of the continent, is apparently quite wanting in Briton,‡ we have the dark *brunneus* in great abundance. It is common in Englnad; and in Ireland is recorded by Messrs. Taylor and Roebuck ("Proc. Roy. Irish Acad.," iv. 673) from more localities than any other

* Simroth, however, does appear to have found a similar form on the shores of the German Ocean. See Dr. Scharff, "Slugs of Ireland," p. 555.

† For further particulars concerning this variety, see "Journal of Conchology," 1883, p. 39; 1887, p. 198.

‡ See also "Slugs of Ireland," p. 538; "Ann. Mag. Nat. Hist.," March 1887, p. 174.

form. In Scotland, Roebuck records it from four counties, but it appears to be less frequent than the blackish form *razoumowski* (= *nigrescens*, Moq.).

33. *A. ater*, mut. *reticulatus*, Roeb. Described from an Irish specimen, but Dr. Simroth has figured ("Zeits. für Wiss. Zool.," 1885, pl. vii. f. 25) the same mutation from Germany.

34. *A. ater*, var. *fasciatus*, Ckll.* This is a brown banded variety, found in Ireland, and recently well figured by Dr. Scharff. The interesting nature of this variety is seen when we note its resemblance to the Portuguese *A. lusitanicus*. Compare, for instance, Dr. Scharff's pl. lvi. figs. 11 and 12, with Dr. Simroth's pl. xii. figs. 7 and 3, in his great work on the slugs of Portugal and the Azores. In England we frequently observe bands on very young individuals of *A. ater*, but they soon disappear.†

In Ireland, the var. *fasciatus* retains them much longer, although even here they become evanescent in old age. Then, in Portugal, we get a distinct but very closely allied species, which is quite commonly banded, though it has banded mutations.

Still another banded form is the var. *cinereus* of Westerlund, with which may apparently be identified the var. *A. ater* described by Mr. W. D. Sutton ("Journ. of Conch." 1875, p. 25), from the Northumberland and Durham district, as, "blackish above, with a black band on each side of the body, and the sides yellowish-white." The form I described as var. *subdeletus* from Ireland is also banded, but immature.

35, 36. *A. ater*, var. *elineolatus*, Ckll., and mut. *subreticulatus*, Ckll. These are two forms from Truro, Cornwall, both with the back black and the sides yellow or yellowish, but in the first the dark lineoles of the orange fringe are wanting; while the second, having the lineoles, has also the sides reticulated with grey. It would appear that *elineolatus* is a variety peculiar to Cornwall, although a very similar form is said by Dr. Scharff to occur very frequently along the sea-shore near Dublin. It is interesting to find that Dr. Leach ("Syn. Moll. of G. B.," 1820, p. 67 of copy of proofs in the Brit. Mus.) long ago found *elineolatus* near Bodmin, and described it as var. 4.

37. *A. subfuscus*, mut. *aurantiacus*, Ckll. An orange form, found in Ireland, and figured by Dr. Scharff (l.c., pl. lvi. f. 19).‡ Locard named a variety from France *aurantiacus* long ago, but as he seems never to have described it, one cannot be certain whether it is the same as that from Ireland. Other very similar forms are on record from various continental localities.

38. *A. hortensis*, var. *fallax*, Ckll. A form coloured like *A. subfuscus* by slime, common at Boxhill. It may be the same as the var. *subfuscus* (C. Pfr.) of the continent, but Dr. Scharff has shown that *Arion subfuscus* has both slime-coloured and truly pigmented forms, and the var. *subfuscus* of *hortensis* may resemble the latter in character. The young of *A. subfuscus* are very similar to *fallax*, and I believe I formerly (SCIENCE GOSSIP, 1886. p. 140) confused them with it.

39. *A. hortensis*, mut. *albipes*, Ckll. An individual mutation with colourless slime, from Middlesex.

40. *A. circumscriptus*, subsp. *ambiguus*, mut. *subalbidus*, Ckll. A form with white sides and dark back, rather after the manner of *A. ater*, v. *albolateralis*. As only one example has been found (in Dorset), it may be simply an individual mutation.

41. *A. circumscriptus*, subsp. *bourguignati*,* mut. *atripunctatus*, Ckll. A form with black dots, from Yorkshire; Dumont and Mortillet have described ("Malac. Savoie," 1852, p. 7) a nearly similar form of *A. subfuscus* from the Alps. In California, *Hesperarion hemphilli* (W. G. Binn) and *H. niger* (Cooper) have varieties much dotted with black.†

42, 43, 44. *Geomalacus maculosus*, mut. *allmani*, Heyn.; mut. *verkruzeni*, Heyn.; mut. *fasciatus*, Ckll. The species itself is confined to Kerry and Cork, in Ireland; and north-west Spain and north Portugal. Simroth lately found mut. *verkruzeni* in Portugal. In Ireland *allmani* would seem to be more common than the yellow and black type (mut. *typicus*, Heyn.). In the British Museum there is a bottle containing eight examples collected by Mr. W. Andrews; one juvenile, three *allmani*, three *fasciatus* and one *typicus*. Another lot of five, presented by Mr. Laughlin, are all *allmani*. A third bottle contains many specimens, including *allmani* and *fasciatus*, and is marked, "An Island in Dingle Bay, West Coast of Ireland. Presented by W. Andrews, Esq."

The mut. *fasciatus*, which is specially interesting because there are normally banded species of *geomalacus* in south-west Europe, may be described as follows:—

Ground colour white or whitish, mantle marbled with black or dark brown, and with dark lateral bands; body hardly marbled, pale, with four dark longitudinal bands, two subdorsal, and two lateral.

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* Seibert ("Mal. Blätt.," 1873, p. 190) described a var. *fasciatus*, which should have priority. It is, however, omitted by Pollonera in his recent revision of the genus, and I have no clear idea of its peculiarities.

† Mr. W. A. Gain, who has reared the species, writes (SCIENCE-GOSSIP, 1890, p. 45) that stripes appear on light-coloured varieties a week or two after leaving the egg, and begin to disappear when the slug is less than half-grown.

‡ Dr. Scharff does not give the varietal names of the slugs he figures. See "Conchologist," 1891, p. 50.

* Mr. Roebuck ("Census of Scottish Land and F.-W. Moll.") records *A. bourguignati*, var. *subfusca*, from two Scottish counties. I have seen no description of this; is it the same as var. *neustriacus* (Mab.)?

† *H. hemphilli*, var. *maculatus* (Ckll. MS., W. G. Binn., sub. *Ariolimax*, 3rd Suppl. "Terr. Moll. U.S.," pl. v., fig. B). Differs from type in being grey with black dots, edge of foot black-spotted at intervals, sole pale ochery, lateral tracts not mottled, liver pale yellowish.

H. niger, var. *maculatus* (Ckll., sine descr., sub. *Ariolimax*, "Nature," May 1890, p. 31). Larger and stouter than *hemphilli*, var. *maculatus*, but exactly like it in colour and markings, except that the lateral areas of the sole are marked in the usual manner of *niger*, and the sole is darker altogether. Liver putty-colour. Received from Dr. J. G. Cooper, Haywards, Cal.

The var. *andrewsi* (Mab.) appears to have been founded on a misunderstanding, and is accordingly omitted.

SUMMARY.

Number of British Species.	Number of British Varieties and Mutations.	Genus.	British Varieties and Mutations. Number also found Abroad.	Number hardly distinct from those Abroad.	Number apparently distinct.	Localities of Endemic forms.
3	3	Testacella.	1	2	..	Middlesex.
5	35	Limax . .	24	5	6	Ireland; Scotland; England.
2	16	Agriolimax	13	2	1	England.
2	7	Amalia. .	2	3	2	England.
5	39	Arion . .	23	10	6	I. of Man; Wales; England; Ireland.
1	3	Geomalacus	1	1	1	Irish only; Co. Kerry.
18	103	All together	64	23	16	..

These statistics will doubtless need alteration in the light of future research; but it seems evident that we have *some* endemic varieties of slugs, one or two of which, like *L. marginatus*, v. *maculatus*, are well-established and very distinct. Yet the amount of peculiarity is nothing as compared to certain continental areas, such as Portugal and the Caucasus, and probably any district in Southern Europe of like area would show as many or more endemic varieties if thoroughly examined.

Institute of Jamaica, Kingston, Jamaica,
June 12*th*, 1892.

SCIENCE-GOSSIP.

Mr. Olivet, of Geneva, has brought out a system of electric heating for conservatories. A dynamo, worked by a motor, sends the current into receivers of special metallic composition, which become rapidly heated up to a certain temperature. This naturally sets up a heated air current sufficient to warm the conservatories. The advantages of its use are, of course, the entire absence of all gases likely to be injurious to the plants, absence of dust, cleanliness, and simplicity of construction in those parts of the mechanism conveying the energy, as well as perfect safety as regards the heat, and complete control over it at any time.

Margarine, as everybody knows, is artificial butter, although it sounds very like the name of a heroine in a novel. It reminds one of the opinion publicly given by a teetotal bishop concerning a now forgotten teetotal drink, that "it looked like beer, smelt like beer, and yet wasn't beer." Margarine looks like butter, tastes like butter, but isn't butter. Chemical analysis proved that it ought to be good food, but the following illustration will perhaps explain how it is people prefer good butter to good margarine. At an asylum of blind children in Kentucky, where butter had been used, the careful manager substituted margarine, believing the old proverb that what the eye cannot see the heart does not grieve for. The blind children were, of course, in no way conscious of the change in their dietary, but by-and-by it was noticed that they gradually ate less of it, and finally they declined it altogether. No effect on their health was discerned, and the only candid answer to their inquiries as to why they did not take the butter was, because they did not care about it.

Some very interesting experiments have recently been carried out in the central markets of Paris in connection with the influence of the electric light upon vegetable growth. The lights used were arc lamps distributed amongst pine, beech, oak, and birch trees. It was found that continuous electric light produced considerable modifications of structure in the leaves and shoots of the trees. The plants breathed, assimilated, and secreted in a continuous manner, but they appeared as if encumbered by their continuity and showed a simpler structure. The shoots were very green, the leaves more open, less firm, and smaller in size.

Irish agriculture is evidently undergoing a change. The Government return just published shows that the total area in Ireland under crops this year is an increase of more than 6600 acres beyond that of last year. The cultivation of oats alone is an increase of nearly 1100 acres, although wheat culture has diminished. In this respect the Irish agriculturists display much common sense. The traditional illusions concerning Pat's potatoes and Pat's pigs no longer stand good, for potato cultivation shows a decrease of over 13,000 acres. There is also a corresponding decrease in the raising of pigs, although live stock generally has increased.

The "Journal of Conchology" advertises the proceedings of the Conchological Society of Great Britain and Ireland, which society during the last few months has brought out a list of shells, called "The Conchological Society's List of British Land and Freshwater Mollusca." Besides this, there are original and interesting notes on a new species of Spondylus, and a new Helix, by E. A. Smith, F.Z.S.; Shell-Hunting in Merionethshire, by G. W. Chaster; on Land and Freshwater Shells at Karachi, by G. W. Adams; Pupa ringens in Cheshire, etc., etc.

The evolution of implements and weapons is very instructive—as, indeed, is everything connected with the history of humanity. The heroic verse which has

been selected by all historic nations, from the earliest periods to the present, as the most fitting medium by which to record the deeds of their grandest men, or heroes, is physiologically associated with the pulsations of the human lung and the beating of the human pulse. Our best and highest animal and intellectual human life is therefore purely rhythmical, songs without words. The simplest-shaped implements of our daily life, to which, perhaps, nobody has paid the slightest attention, or has asked how that shape came to be brought about, may be bound up with the historical evolution of the human race, after the manner of the Brandon pickaxe (Suffolk). An ethnologist has just discovered that the well-known saddler's knife, used by all leather-cutters at the present day, is one of the oldest metallic instruments extant, inasmuch as it is represented on the most ancient Egyptian monuments; but the very shape of the ancient Egyptian saddler's (or skin-cutting) knife had been in existence 10,000 years before, when knives could be formed only of flint instead of iron—just as the circumcision-knives were formed of the same material in the days of Moses.

SILICATE of soda united with ground glass makes an acid-proof cement. White and red lead united and made up with boiled linseed oil is suitable for many purposes. Asbestos powder united with liquid silicate of soda to form a thick paste will stand acid vapours.

MESSRS. CHAPMAN AND HALL will shortly publish a new popular work by the Rev. H. N. Hutchinson, entitled "Extinct Monsters." The book will be illustrated by that excellent animal artist Mr. J. Smit, who has made twenty-four beautiful restorations of some strange and wonderful antediluvian animals.

THE recent discoveries of Professors Marsh and Cope in America, such as great sea-serpents and armoured dinosaurs, will be for the first time brought before the public in a series of restorations. The book is not intended for geologists only, but for all who are interested in the study of animal life. Since the days of Dr. Mantell little has been done to describe in popular language the world's "lost creations." Dr. Henry Woodward, F.R.S., Keeper of Geology, Natural History Museum, contributes a preface.

MICROSCOPY.

THE DIATOMIST.—We have received No. 10. of this quarterly specialistic work on Diatoms, edited by M. Tempère and other distinguished diatomists. As a rule and as far as possible each number is a monograph on some special and leading genus of diatoms. Hitherto each issue has been admirably illustrated, and the care taken in bringing out their illustrations as artistically as possible is shown by the fact that the present number, devoted almost entirely to the Entogonia, is not accompanied by the usual plates, the editors frankly stating that they did not turn out so well as they wished them to be, and they have therefore postponed their publication until the next number.

"SUBSTITUTE FOR CANADA BALSAM."—W. Payne begs to draw the attention of the Editor of SCIENCE GOSSIP to an apparent error—important—in the description of a *substitute* for *Canada Balsam*, p. 236. At line twenty-one the direction says, "three parts acid to one of oil of cinnamon is added to nine." There is no other mention of "acid" and "nine" is without a substantive. Probably a line or two of the MS. are omitted.

ZOOLOGY.

UNKNOWN INSECT.—Referring to the insect spoken of by Mr. Lord, it is in all probability a mite, perhaps of the genus *Glyciphagus*, which occurs sometimes in incredible numbers on furniture which has been packed with hay or straw. *G. spinipes* is a well-known species, occurring almost everywhere, and by referring to the diagnosis of the above species or genus Mr. Lord will, I think, be able to identify his "Unknown Insect."—*J. Macnaught Campbell, F.Z.S., Kelvingrove Museum.*

UNKNOWN INSECT.—The insect described in the September number of SCIENCE GOSSIP is, I think (I identify from memory), *Chlotilla pulsatoria*, of Linné. It is a wingless neuropterous insect belonging to the family Psocidæ, the apterous species of which are very louse-like. The family is fully described in the "Entomological Annual for 1861," and the "Entomologist's Monthly Magazine," vol. iii., both obtainable from Messrs. Gurney & Jackson, Paternoster Row, London, E.C.—*W. H. Nunney.*

SUPPLEMENTARY REPORT UPON THE TESTACEOUS MOLLUSCA.—This pamphlet, reprinted from the Trans. of the Liverpool Biological Society, and kindly forwarded to us by Mr. B. Tomline, contains a list of some hundred and thirty or forty different species of Mollusca found in the L.M.B.C. district, thirty-seven of which have been added to the list since 1886. The late Mr. Francis Archer took great pains and spent much time and consideration on this valuable report, and it will prove very useful to naturalists in that locality.

SPHINX PINASTRI.—Lord Rendlesham writes to the "Entomologist" for October:—"My sons and myself, during the first portion of August, captured eleven specimens of Sphinx pinastri during the daytime, sitting on Scotch firs in some woods near here.

We left several more, which were damaged specimens, on the trees. From a female we got several eggs, and have a nice quantity of larvæ, feeding well on Scotch fir for the last ten days."—*Woodbridge, Suffolk.*

GRAPTA C. ALBUM IN NORTH WALES.—In the middle of August last, one of my sons captured a good specimen of *Grapta C. album* at the foot of Penmaenmawr, North Wales. As in my copy of Newman's Natural History of British Butterflies and Moths, no capture of this insect is recorded in Carnarvonshire or any of the adjoining counties of North Wales, the occurrence may be of interest to your entomological readers.—*M. J. Fendale.*

"POND-LIFE STUDIES."—Allow me to point out that the first of Mr. H. Durrant's "Pond-life studies" on *Cyclops quadricornis* is full of inaccuracies, and is most misleading as to the state of our knowledge of this interesting genus. For the benefit of those really wishing to know something about the "common Cyclops," I may mention that in the first volume of Professor G. S. Brady's Monograph of the British Copepoda (Ray Society, 1878) they will find many species carefully figured and described, and further that the same author published last year, in the Natural History Transactions of Northumberland, Durham, and Newcastle, a complete revision of the genus, with a description of twenty British species. This paper, entitled, "A Revision of the British Species of Fresh-water Cyclopidæ and Calanidæ," is now issued separately by Messrs. Williams & Norgate.—*D. J. Scourfield.*

THE GALLINACEOUS QUAIL.—This quail has hitherto been regarded as an unknown quantity in the game preserves around Burton, but when we hear of a nest of the bird's eggs being found on the sewage-farm, and one or two well-known guns turning up half-a-dozen specimens, we may begin to look for their inclusion in the list of bags which are published from time to time. Sportsmen will be interested in learning that quite recently the hon. member for the division (Mr. S. Evershed) and his sons flushed five and killed four at Grangewood. Eighteen years ago, when Mr. Evershed first took to the land, he killed a quail, but no such experience has fallen to his gun during the long lapse of years until the present time.

GEOLOGY.

NEOLITHIC IMPLEMENTS.—I came across a circumstance the other day which is sufficiently out of the way to record in your pages. The quiet village of Eastdean, which nestles in the valley at the back of Beachy Head, is less than four miles from Eastbourne. There can be found a garden with terraces. The retaining walls are of flint, low and somewhat loose. To the most casual observer they seem unusual. To a keen eye it is at once apparent that very many of the flints are worked. Close examination proves that all are more or less interesting and perfect neoliths. Then the astounding fact comes out that one man, by the most active industry, within a radius of five miles from his own house has collected so many stone tools, that after keeping in his collection thousands of beautiful specimens, he has used thousands more in his garden facing-banks. One knows not which to wonder at most, the wealth of such tools in this district, or the astounding industry of Mr. Hilton in seeking them. How many miles of weary plodding such a collection represents, only those who have tried know. Now they are collected they gain (and should give to all) great interest, and it is to be fervently hoped that the county of Sussex will prevent their dispersal. All those who are interested in prehistoric history, owe to Mr. Hilton a debt of gratitude for the valuable lessons to be found in his most important and unique collection.—*H. Stopes.*

NOTES AND QUERIES.

REMARKABLE SPECIMEN OF TWAY-BLADE.—In June 1890, I met with a specimen of Tway-Blade very similar to the one figured in your issue of this month, except that there was no flower-stalk at all, the third small leaf seemed to take its place. I found it on Tyler's Hill, near Chesham, an outlier of the London clay—an interesting place, I should think, for both botanist and geologist. At the same time I found there *Æcidium primulæ* in abundance, "not a common" fungus, Dr. Cooke says, in "Rust, Smut, and Mildew." By the way a new edition, up to date, is sadly wanted of this book; the last was, I believe, issued in 1878.—*J. W. Walker.*

THE PRESERVATION OF SEA-URCHINS.—Would some collector kindly insert a short article on the preservation of sea-urchins, showing how to preserve them so as to keep their spines from dropping off? I have tried over and over again and failed.—*A. Bennetts.*

A RIVAL TO THE TOAD IN THE ROCK.—I enclose a cutting from a local newspaper, giving an account of a most curious discovery, about which it is certainly necessary to have "more light." Are we to accept it as the outcome of American humour, or the product of the silly season. It seems to be one of those very tall stories that originate only in the New World. "What is, with apparent reason, claimed to be the most interesting combined entomological and mineralogical specimen in existence is now (says *Iron*) on view in the office of an El Paso newspaper. Some months ago, it appears, a Mr. White was presented with a sample of ore taken at a considerable depth from the Longfellow Mine, Clifton, Arizona. When the mineral was fractured, a beetle of a dull reddish-grey colour, as perfect in form as it had been in life, was exposed to view, surrounded by a closely-fitting shell of iron ore. Naturally much impressed with his coleopteral prize, Mr. White hastened to

envelop it in a piece of cloth, with the intention of conveying it to his cabinet. On his way thither, however, he had occasion to examine the interesting specimen, and his surprise may be better imagined than described when he perceived a young beetle, resembling in every way the larger insect, except that it was smaller, emerging from its dead parent's body. Mr. White kept the live beetle under a glass for five months and before it died at the end of that period, to paraphrase the old song, so young and yet so old, it seemed to be thriving, and had perceptibly increased in size. The larger insect, in its iron cyst, and the younger beetle, which was indubitably generated in prehistoric times to be born in 'this wonderful nineteenth century,' may be inspected by all who should happen to be in the vicinity of the district mentioned."—*F. G. Bing.*

Query as to an Algerian Insect.—I send herewith some sketches of parts of an insect which committed suicide on my lamp a few nights since, and as it was a stranger to me I examined its mutilated remains, and found them sufficiently curious. I suppose it is a saw or ichneumon fly, but am not entomologist enough to identify it, and have no reference library available. I shall be glad if you can name it and shortly state what may be known of its life-history and relations. Its total length was barely ½ in., colour light sandy-brown, lower wing longer and narrower than upper. No hooks were seen on the wings, but they were much mutilated, especially the lower ones. The nerves of the upper wings presented a curious knotted appearance under a low power, under a higher one the "knots" appear to be vesicles or hair bulbs, or possibly perforations in the membranes. The nerves of the lower wings are without any trace of these knots, but are of irregular outline, and in both wings the nerves are of dark brown colour, while the membrane seems structureless and colourless. There was only a slight reticulation on the upper wing to represent the "stigma." The edges of both wings present a very regular imbrication or scalloped appearance, finer in the lower than in the upper wing, and in the former only each scallop terminated in a very fine point or hair. The upper wing showed no scalloping on the outer margin until reaching the stigma. The minute hairs were more plentiful on the lower than the upper wings, as shown. The posterior legs showed some curious spurs, especially a comb of 19 teeth projecting from the lower joint of the tibia. Anterior legs were free from these spurs, but hairy. Middle legs could not be found. The antennæ are very curious, a short hairy first joint, which lies in a niche or depression nearly cutting the compound eye into two parts, the second joint short, club-like, carrying several circles or crowns of erected papillæ, with fine long bristles inside and outside the circle. Attached to the extremity of this point by a transparent ball, apparently, is a long bristle of 13 or 14 joints, the first being bulbous, and the remainder much thinner, tapering slightly and irregularly, colour dark, joints marked by transparent transverse spaces. The ovipositor retracted lies entirely inside the abdomen. Its sheaths are dark, and very finely serrated near the tip. The internal spear carries rounded teeth well spaced, somewhat like those of the lancet of the gnat. Are they for cutting animal tissues too?—*Henry M. Sayers.*

A singular freak of nature was to be seen a few days ago in one of the gardens between Northgate Street and the river. A young apple-tree (Lane's Prince Albert) planted last autumn had been considerably cut up by the frosts, and only bore one apple. At the end of the twig upon which the fruit hung there was, however, a handsome bunch of blossom. Ripe strawberries have also been picked, both at Canterbury and Ashford within the past few days.—*Kentish Gazette, Canterbury.*

Our "Exchange Column" and how it is used.—The following appears in a leading Scotch paper:—

Owls and Mice.—The following advertisement, cut from Science Gossip, is pertinent to the subject of the recent correspondence in your columns.—"For exchange, a number of long-eared owls' eggs. Wanted, Norfolk plover, nightjar, petrels (leach and fork-tailed), raven, oriole, or any of rarer hawks. Also several clutches of common sand-pipers' eggs. Wanted in exchange, dunlins, redshanks, jays, bullfinches; other offers considered. The eggs are all side-blown, and taken by me here this season.—R. Armstrong, B.A., Thornhill, Dumfriesshire, Scotland." You will observe that Mr. Armstrong's industry is carried on in the very heart of the vole-infested district.—*Herbert Maxwell.*

The Limpet's Adhesive Power.—Dr. Lawrence Hamilton, of Brighton, writes in "Natural Science" as follows:—Having previously ascertained by a series of experiments, made at Folkestone in June, 1889, the force necessary to overcome the great powers of adherence of the limpet (or upwards of 1984 times its own dead weight, allowing for the limpet being deprived of its shell), I determined to make another series, in order, if possible, to find out the source of these remarkable natural adhesive properties. To do this, I placed several limpets on the side of an empty glass tank; I then drilled two holes through different rings in the top of each shell, and passed through them a stout copper wire. The ends of this wire were twisted together, and then attached to a spring balance. By pulling on the latter, the force necessary to detach the limpet could be readily observed. Owing to the glass plate, it was easily ascertained that no air-space existed beneath the foot, which in every part was in close contact with the glass. On exercising slight traction on the limpet, the foot and mantle became still more closely applied to the surface of the glass. On injecting the limpet with corrosive sublimate, more than sufficient to immediately destroy all vitality, the shell became quite loose, but still the foot remained adherent. The force necessary to detach the dead limpet was, however, very much less than in the case of the living, for whilst a force of 35 lbs. was required to remove the living limpet, 25 lbs. sufficed to displace a limpet immediately after poisoning. Twenty-four hours after death a force of 9½ lbs. was required to detach the limpet. When the limpet was dislodged, a thin gelatinous coat remained on the glass wall; this substance appeared only slightly soluble in sea-water. From the above experiments, we may, perhaps, be justified in concluding that while some portion of the adhesive power may or may not be due to atmospheric pressure, a very considerable amount, if not the major part, or perhaps all, is probably dependent upon the throwing out of a very tenacious substance. In favour of the latter view is the definite evidence of the absence of a vacuum beneath the foot, or of any mechanism whereby such a vacuum might be produced, such for instance as is seen in the suckers of the tentacles of octopi, &c., and the fact that the adhesion continues after the death of the animal, as well as the positive proof of a tenacious secretion. In these experiments the shell

never parted company with the limpet. There exists between the shell and the living tissue an extremely intimate union brought about slowly iu the progress of the growth of the animal. But perhaps owing to the formation of some cement substances, a rapid temporary union may possibly be formed between the rock and the living tissue of the limpet. With regard to the secretions of the limpet, it may be mentioned that many species gradually eat their way into the hard strata to which they may be attached—limestone, old red sandstone, &c. It is evident that the limpet is a distinguished independent practical manufacturing chemist, whose small self-contained domestic portable laboratory makes three home-made special and distinct natural secretions. One to build its shell, the other to glue itself to its native rocks, and the third secretion to act as a solvent to partially dissolve certain geological soils.

THE VARIEGATED SLUG.—I have sent you a slug by parcel post, which I believe to be the variegated slug (*Limax variegatus*). You will doubtless recognise him. I have a natural bed of mushrooms, which these slugs attack directly they come above the ground, and consume them. I enclose you some of the partially eaten mushrooms, with a fine specimen of the slug. I can send you some more of them; I expect some of you have a mushroom-bed to feed them on. Can any reader tell me how I can get rid of the voracious slugs without destroying my natural bed, which is on a gravelly earth-made soil close to the salt water, but elevated, a quay in fact, so that the salt water does not flow over it.—*W. Penney.*

INTELLIGENCE OF MONKEYS.—Some time ago, I saw in a magazine, a statement to the effect that no monkey possesses sufficient intelligence to untie a knot; this of course is erroneous, as probably everybody who has kept a monkey knows. Mr. Belt in "The Naturalist in Nicaragua," says, that his monkey not only untied knots, but opened the links of a chain. At the same time, the statement that they cannot, must I presume, have been founded on some evidence, and, as some observations which I made bear on this subject, they may not be entirely devoid of interest. In 1884 I was in camp in Gorakhpur; I was one day given a young monkey just caught; as was my usual practice with wild animals I kept it tied up for a couple of days, feeding it well and frequently stroking it, and then gave it entire liberty. Unlike the other animals, however, the monkey did not avail himself of his liberty to go away temporarily; on the contrary, he seemed afraid to venture to any distance from my tent, and the sight of wild members of his own species threw him into a condition of abject terror. He soon became very tame, and very inquisitive, but contrary to my expectations, not mischievous; on the contrary, he was almost ludicrously careful not to injure anything, and when he accidentally broke any article, he seemed much distressed. I had business at a place named Chaumukha, where there was a bungalow in which I stayed, and here the monkey became a nuisance, jumping into my lap, and wanting to be nursed, when I was writing; accordingly I tied him to the leg of my bed with a piece of thin rope. For one day this was effectual, but the second day, soon after I had begun writing, the monkey made his appearance, trailing the rope, having evidently untied it from the bed-leg. The next day I tied him up as before, but instead of going away, I hid behind the door and watched. The monkey first examined the knot very carefully, turning it over with his hands, and apparently tracing the course of the rope with his fingers, but making no attempt to untie it; after he had studied it for some time, he untied it without any hesitation and fairly rapidly; I noticed that he only used his fingers, and that they seemed to be somewhat clumsy. This suggested to me that if I used thinner cord, the monkey might be unable to get a grip with his fingers, and on trial I found this was so; moreover, the monkey, after having vainly tried to untie the knots for a couple of hours, gave it up in despair, and then made no further attempt on any subsequent day. So, if I had then given the monkey to someone else, and he had tied it up with thin cord, he might have concluded, from the fact of the monkey making no effort to untie the knot, that he lacked the necessary intelligence, while it really resulted from his knowledge of the uselessness of the attempt.—*J. R. Holt.*

WHAT length of three-quarter-inch diameter pipe would be required to hold exactly one gallon of water? An answer in SCIENCE-GOSSIP to this question will greatly oblige an old and regular subscriber.—*R. C. Chaytor, Scrafton Lodge, Middleham.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

TO ANONYMOUS QUERISTS.—We must adhere to our rule of not noticing queries which do not bear the writers' names.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply DISGUISED ADVERTISEMENTS, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges," which cannot be tolerated.

WE request that all exchanges may be signed with name (or initials) and full address at the end.

SPECIAL NOTE.—There is a tendency on the part of some exchangers to send more than one per month. We only allow this in the case of writers of papers.

TO OUR RECENT EXCHANGERS.—We are willing to be helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

CORRESPONDENT, c.o. Mrs. Grimes, Coningsby House, Staines.—The Editor is sorry to be obliged to address you as above, but your note had no personal address. The specimens forwarded are extremely interesting. The plant is the yellow cornflower (*Chrysosplenium segetum*). The "monstrosity" seems to be due to the hyper-development of the receptacle, this being a composite plant. As far as could be made out the "monstrosity" is due to the action of some species of gall insect.

LLESBA.—The stone you refer to is evidently a lower chalk flint containing the impression of the spine of a fossil *Cidaris*, or sea-urchin. See Taylor's "Common British Fossils" (London: Chatto & Windus).

C. W. MAW.—It was very difficult to correctly identify your larva, but it seems to be that of the common swift (*H. lupulina*).

C. W. OAKDEN.—We shall be very pleased to have short reports of the meetings of the Q.M.C. at any time, for publication in SCIENCE-GOSSIP.

W. GROVES.—Many thanks for the double apple. We published the illustration of a similar one in 1890, in the papers on "Vegetable Teratology." It is also illustrated in Dr. Master's famous book on the same subject. Double apples and plums are not uncommon, as every fruiterer on a large scale will inform you.

I. W. MEASURES.—See Dr. Aitkin's papers read before the Royal and Physical Societies of Edinburgh, on "Dust." Most of them were lengthily reported in "Nature," to the editor of which please apply.

J. KLONOWSKY.—The occurrence of three-clawed lobsters and crabs (in front claw) is not uncommon.

EXCHANGES.

WANTED, foreign land and marine shells, also minerals and coleoptera. Exchange shells, coleoptera, and other natural history objects, and stamps.—Hall, 12 Derby Road, Watford.

RARE British plants, birds' eggs, lepidoptera, land, freshwater, and marine shells, in exchange for others, or for British or foreign coins.—W. Jordan, Honington, Bury St. Edmunds.

LOCAL lists. Some local lists of British mollusca have recently appeared, which I have not had the opportunity of seeing. I should be very grateful to the authors of any such if they could spare me a copy, and would send some of my own papers in return, if desired.—T. D. A. Cockerell, Institute of Jamaica, Kingston, Jamaica.

OFFERED, "Hunting of the Snark" (1st ed.), Remsen's, Luff's, Armstrong's, and Tilden's Chemistries, SCIENCE-GOSSIP for 1875 and 1889. Wanted, SCIENCE-GOSSIP for 1871, 1878, and 1892, "Nature Notes," "Gardeners' Chronicle," Jefferies' works, any books on gardening, science and natural history, and articles or reviews of Jefferies.—H. Roberts, 22 Carlingford Road, Tottenham.

OFFERED, vertigo sub-striata for other rare shells.—Fred. Taylor, 80 Trinity Street, Oldham.

WANTED, a secondhand cabinet for moths, corked and glazed. Send particulars to—S. B. Chandley, Warrington.

OFFERED, three dozen lantern slides, 100 British mosses accurately named, Quekett's "Lectures on Histology," Prichard's "Microscopic Cabinet and Illustrations," 1832. Offers wanted.—Barker, 24 Avenue Villas, Cricklewood.

DUPLICATES.—Eggs of gt. plover, razorbills, guillemots, magpies, jackdaws, sandmartins, com. terns, moorhens, puffins, blackcaps, lapwings, partridges, and one golden plover. Desiderata, Cuckoo's eggs with clutches, hawk's, and many others.—E. G. Potter, 19 Price Street, York.

WANTED, Hooker's "Student's Flora," 3rd ed., Müller's "Fertilisation of Plants," Darwin's "Fertilisation of Orchids," "Sach's "Text Book of Botany," Babington's "Manual of British Botany," 8th ed. Offers to—Alfred Dymes, 26 Blenheim Crescent, Ladbroke Grove, W.

WANTED, minerals, brachiopods or micro. slides, in exchange for other minerals, inf. Ool. brachiopods and Barton clay fossils, named and localised.—E. H. V. D., 46 Upper Belgrave Road, Clifton, Bristol.

WANTED, fossils, named and classified, from any formation but silurian; also labradorite, augite, magnetite, phonolite, trachyte, pitchstone and obsidian, hornblende, calamine, chalcopyrite, malachite, cassiterite, pyrolusite, psilomelane, manganite, graphite, cobalt, and uncut stones, jaspers, cornelians, etc. Will exchange photographs (8 × 6) of centenary engines, Stevenson's and Trevetick's engines, American engines, Swiss, German, and Egyptian engines, Taff Vale and Ilfracombe views, and express engines up to date.—Reginald E. M. Bleasdale, Church Lench, Evesham.

WANTED, "British Lichens," by W. L. Lindsay, in exchange for various periodicals.—F. Coles, 53 Brooke Road, Stoke Newington, London.

WANTED, *T. maugei, S. oblonga, Z. draparnaldi, H. revelata, H. obvoluta, B. montanus, V. alpestris, V. pusilla, V. edentula, A. loineata*, or varieties of land and freshwater not in collection. Offered, British marine shells. List sent.—James Simpson, 6 North St. Andrew Street, Aberdeen.

WANTED, good healthy pupæ of British sphingidæ in exchange for foreign butterflies in good condition.—K. Hurlstone Jones, St. Bride's Rectory, Old Trafford, Manchester.

FOR exchange, *Unio pugio, U. olivarium, U. marginalis, U. crispisulcatus, U. corrugatus, Monochondylea salviniana, M. crebistriata, Corbicula Kashmirensis, Scaphula celox, Pecten bifrons, P. laqueata, P. lemniscatus, Trigonia pectinata, Lima bullata, L. angulata, Mactra Matthewsi*, also 1000 species of land and marine from various countries. Offers requested in land and freshwater.—Miss Linter, Arragon Close, Twickenham.

WANTED, in exchange for standard text-books in classics, science, and theology, standard text-books and memoirs in natural history.—Rev. T. Shankland, Rhyl.

WANTED, fossils (preferably from red crag or carboniferous) or good mineral specimens, in exchange for 1892 numbers of "Boy's Own Paper," and the numbers of "Outdoor Games and Recreations," both unbound, all excellent copies; either or both. Best offer accepted.—F. Renwick, St. Ives, Queen's Road, Leytonstone, Essex.

FOR exchange, shells from Madeira, Gibraltar, Tangier, Australia, Vancouver Island, etc. Only good specimens taken in return.—H. L., 270 Uttoxeter New Road, Derby.

DUPLICATES.—*Athalia artemis, Selenis W. album, Paphia, Galathea, Phleas, Hyperanthus, Alexis, Sylvanus, Jacobæ, Sylvata, Cardamines, Filipendulæ, Caja, Cardui, Atalanta Urticæ, Grossulata, Pamphilus, Janira, Io.* Desiderata, showy species.—W. H. Scott, 89 Prospect Hill, Leicester.

OFFERED, eggs of merlin, capercaillie, ptarmigan, ring-ousel, twite, shoveller, sociable plover, owls, etc., for landrails, skylarks, shrikes, ring-plover, quail, jackdaw, heron, and many others.—Jas. Ellison, Steeton, Keighley.

SCIENCE-GOSSIP for 1881–82, bound, and for 1867, 1887–89, and 1891 unbound. Wanted, foreign stamps or offers for whole or portion.—W. Enright, 59 Kyverdale Road, Stoke Newington, London, N.

WILL exchange foreign stamps for scientific books or electrical apparatus.—F. Lyddon, 14 West Park, Clifton.

A LARGE quantity of fossils illustrating nearly all British strata, named and localised, and a number of good British land and freshwater shells. Wanted, land and freshwater shells not in collection, old copper coins and tokens, and old postage stamps.—Robert Cairns, 159 Queen Street, Hurst, Ashton-under-Lyne.

WANTED, good secondhand microscope. Can offer shells, fossils, polished Devonian corals, microscopic objects. Also wanted, rare British shells.—T. E. Sclater, Natural History Stores, 43 Northumberland Place, Teignmouth.

ADEORBIS (live), *Rissoa striatula* (live), *R. lactea* (live), *Chiton scabridus, C. cancellatus*, and other shells offered for shells not in collection.—E. R. Sykes, 13 Doughty Street, London, W.C.

WANTED, good specimens of L. C., 8th ed.: 53 (wild or cult.), 273, 627, 649 (wild or cult.), 883, 1018, 1105, and 1393. Will give in exchange rare British or foreign plants —A. E. Lomax, 56 Vauxhall Road, Liverpool.

OFFERED, SCIENCE-GOSSIP for 1881 to 1891, unbound, in exchange for first-class micro. slides, preferably diatoms and forams.—J. L. Smithett, 45 Highbury Hill, N.

MAUND'S "Botanic Garden," first nine volumes, library binding, 820 coloured figures and 1357 outlines, with descriptions, etc. Wanted, a thoroughly good object-glass, one-eighth preferred, for microscope.—Joseph Wallis, Deal.

OFFERED, fossils from Pleistocene, Woolwich and Reading beds, chalk, gault, coal-measures, and carboniferous limestone; minerals; and good specimens of *Drosera rotundifolia*. Wanted, fossils and minerals.—E. Dixon, 55 Brownhill Road, Catford, S.E.

OFFERS wanted for Nos. 1 to 60 of SCIENCE-GOSSIP, and Hardwicke's "Guide to British Hepaticæ," complete, all unbound. (Query address?)

A. BONNET, of 53 Boulevard St. Michel, Paris, offers good fossils from the miocene of Pont-Levoy, France, in exchange for recent shells and fossils of all kinds. In case of need, correspondence may be sent through I. T. Day, Cowslip Road, S. Woodford, Essex.

WANTED, collections of stamps, coins, and science books. Offered, natural history specimens, etc.—Miss M. E. Pepperell, 5 Park Street, Bristol.

WANTED, collections of lepidoptera, rare species and good vars. Good exchange.—W. K. Mann, Willington Terrace, Clifton, Bristol.

WILL give micro. slides in exchange for other slides, or books (natural history preferred).—Platt, Eastrop, Basingstoke.

BOOKS, ETC., RECEIVED FOR NOTICE.

"Proceedings of the Liverpool Geological Society."—"The International Journal of Microscopy and Natural Science" (London: Baillière, Tindall, & Cox).—"Natural Science" (London and New York: Macmillan & Co.).—"The Botanical Gazette" (Bloomington: Indiana).—"Glimpses into Nature's Secrets," by Edward Alfred Martin (London: Raithby, Lawrence & Co., Ltd.).—"Amidst Nature's Realms," by Edward Alfred Martin (London: Raithby, Lawrance & Co., Ltd.).—"Beneath Helvellyn's Shade," by Samuel Barber (London: Elliot Stock).—"Wood Carving, with Suggestions in Chip Carving," by Thos. C. Simmons (London: Bemrose & Sons).—"Feuille des Jeunes Naturalistes," and "The Naturalists' Journal" (London: W. Longley).—"The Annals and Magazine of Natural History" (London: Taylor & Francis).—"The Geological Magazine" (London: Kegan Paul, Trench, Trübner & Co.).—"The Naturalist" (London: Lovell Reeve & Co.).—"The Botanical Exchange Club of the British Isles" (Manchester: printed by James Collins & Co.).—"Nature Notes" (London: H. Sotheran & Co.).—"The Entomologist" (London: West, Newman & Co.).—"The Idler."—"The Midland Naturalist."—"Jupiter and his System."—"Journal of Conchology."—"How to Make Common Things," by J. A. Bower (London, Northumberland Avenue: Society for Promoting Christian Knowledge).—"Central Experimental Farm."—"The Cattle Horn-Fly," etc., etc.

COMMUNICATIONS RECEIVED UP TO THE 11TH ULT. FROM: I. G.—W. H. N.—W. H. L.—W. M. R.—P. S.—W. J.—T. H. H.—G. D.—T. D. A. C.—H. M. L.—J. H. A. H.—A. B.—Mrs. P.—F. G. B.—A. R. W.—F. T.—A. P.—H. R.—C. M. M.—S. G. F.—E. H. E. D.—R. E. M. B.—W. P.—A. D.—E. G. P.—Mr. B.—S. B. C.—J. W. M.—H. L. T.—W. E.—R. C. J. E.—H. F.—K. H. J.—F. S. L.—J. E. N.—D. B.—M. J. T.—F. G. B.—T. E. S.—F. R.—W. H. S.—Japan Society.—T. S.—Miss L.—J. S.—F. C.—H. S.—E. R. S.—D. J. S.—T. A. W. Rees.—R. C.—A. E. L.—E. D.—J. L. S.—J. R. H.—A. A.—J. W.—E. A. M.—W. M. R.—F. W. L.—G. A.—H. C. R.—etc., etc.

ANIMAL PLAGUES.

By P. L. SIMMONDS, F.L.S.

NOTWITHSTANDING all the complaints of our changeable and unsettled climate, we are at least free from many of the scourges of other countries. We have not the long droughts of Australia, nor the heavy rainy seasons of the tropics; we have not many of the animal plagues to which some districts are subject, whether they be wild beasts in the shape of wolves, tigers, and lions, among the reptiles alligators and crocodiles, or the dangerous snakes; nor even in the insect tribes have we the tsetse fly to kill our cattle, the locusts and ants to devastate our fields, or the chigoes, fleas, and clouds of mosquitoes and flies to annoy our person. We are free from wild animals, except those we encourage for hunting. In India 23,000 persons are killed annually by wild beasts, tigers, leopards, bears, wolves, hyenas, and other carnivora, or by snakes; and over 68,000 cattle are also killed by these. The venomous snakes of India are colubrine and viperine; about seven of the former are very poisonous; over 578,400 snakes are killed yearly in India, the sum paid by government for killing them amounting to 2500*l.* to 3000*l.* The reward given for each snake killed ranges from 6*d.* to 3*s.* in different presidencies. Snakes seem to abound most in Bombay, more than four-fifths the number killed annually being in that presidency. There is a deep-rooted prejudice among most natives of India against killing a snake—a prejudice which the offer of the small reward has scarcely overcome; indeed, how can one expect a man to risk his life for a few pence? The number of wild beasts killed in India in 1889 the latest published return), was 29 elephants, 1312 tigers, 4179 leopards, 1194 bears, 4630 wolves, and 1348 hyenas. About 17,600 seems to be the average number of wild beasts destroyed yearly. In France the State pays 3*l.* for each wolf killed; the number slaughtered dropped from 1225 in 1882 to 700 in 1887.

The Russian forests contained in 1880 170,000 wolves, which, together with bears, devour annually 200 children or travellers, 500 horses, more than 1000 oxen, and over 4000 other domestic animals. The slaughter in the empire of Austria yearly is 160 bears, 200 hyenas, and 1200 wolves. In Finland wolves destroy 5500 horned cattle annually.

In India, in 1889, 25,204 persons were killed by wild animals and snakes, chiefly the latter, 22,480. About 70,000 cattle are killed yearly, chiefly by tigers and leopards, wolves and hyenas, and nearly 4000 by snakes.

In Java there are 270 persons killed yearly by tigers, and 180 by crocodiles. The latter reptile is not made a pet of as by some of the Indian fanatics, who will not kill them, but rather cherish them. The locust is another pest, the deposit of whose eggs in the soil breeds consternation in the land. In the countries bordering on the Mediterranean these insects often appear in incredible numbers; millions of them may be seen covering the ground for miles, many inches thick, and although the natives sometimes eat them, and try also to utilise them as bait for the sardine fisheries, they are still an intolerable nuisance in northern Africa, Cyprus, and other quarters. In Cyprus the peasants are paid 40*l.* for every ton of locust's eggs which they destroy; some

years destroying 60 tons, which is equivalent to 4680 million locusts. But it is not only in the countries of Europe, Asia, and Africa that these animal plagues are met with. The British settlers in Australia are complaining bitterly now of indigenous and introduced pests. They encountered at first one or two formidable ones in the dingos and marsupials, but have found a more serious and extensive one in the rabbits introduced from England, whose vast multiplication and ravages have become intolerable. While in Europe we esteem and propagate this rodent for its flesh as food, in Australasia, where larger live stock are so abundant, they set little value on its flesh. In the United Kingdom some 30,000,000 of hares and rabbits are used up, worth over 2,000,000*l.* sterling. The rabbits bred annually in Belgium are valued at 480,000*l.*, and we import annually 144,000 cwt. of foreign rabbits, worth about 400,000*l.* The kangaroo plague has always been a great nuisance to the Australian squatters, for on an average these animals consume as much grass as a sheep. It is stated that on a sheep-run of 60,000 to 80,000 acres, 10,000 kangaroos were killed annually for six consecutive years, and yet their numbers remained very formidable in the locality. In the colony of South Australia hundreds of thousands of kangaroos are slaughtered annually for their skins, and the bonus offered by the authorities. The number of these marsupials in New South Wales in 1889 was estimated to be over 4,000,000, and yet about half a million kangaroos and 650,000 wallabies were destroyed in the colony in that year. A bonus of 8*d.* for each kangaroo killed is offered in Australia; hence the colonists are gradually exterminating these native animals; over half a million skins are annually shipped to England, and a large number to North America, to be converted into leather. The Macropidæ include several kinds of kangaroos and wallabies. The progress of settlement in Australia has driven these animals from the more densely populated parts of the Australian continent, but, in the country and unsettled districts, they are still numerous enough to cause very considerable damage to the natural grasses. So serious has been the injury thus wrought, that the colonial governments and run-holders pay a small sum per head for the destruction of the kangaroos. The acclimatisation of the more useful European species quickly follows the destruction of indigenous animals, and the wilds of the interior of Australia, which were formerly the abode solely of the dingo and kangaroo, are now the home of vast flocks and herds. Seeing how largely we are dependent for our wool-supply on Australasia, any check to that production is very serious. As there are now 100,000,000 sheep in Australasia, furnishing us with 430,000,000 pounds of wool annually, besides their skins and mutton, the steady progress of sheep husbandry is important. The number of kangaroo skins shipped from Melbourne in the last fourteen years exceeded 1,000,000; besides the large number used up in the local tanneries, where they realise about 3*s.* a skin. At the public leather sales in London on one day in May last year, nearly 3000 kangaroo skins were sold. The wallabies are a smaller species of marsupial than the kangaroo, and belong to two distinct genera, Halmaturus and Petrogale. Some 60,000 or 70,000 of these are annually shipped from Australia as furs. The skins of the Australian opossum are very handsome, and their thick soft fur affords a valuable article of commerce, being employed like hare skins for chest protectors, and lately for making gloves. About 2,000,000 opossum skins are exported annually from Australia. In the ten years ending with 1888, 3,000,000 opossum skins were shipped from Melbourne alone. As a kangaroo can clear a fence eleven feet high, wire fences, which are used against rabbits, are of no use.

The dingo or native dog is another pest which is found in all parts of the Australian main land. It is allied to the wild dog of India, and may probably have been introduced by the Malays some centuries ago. Great destruction has been wrought amongst the flocks of the settlers by these animals, and a price is paid for every native dog destroyed.

When rabbits were first introduced into Australia, no one seems to have thought of the nuisance they might eventually become, and of the large expenditure which would be necessary to keep down their numbers. There are now few parts of the settled districts which are not infested with them, and it is found that if the exterminating efforts are relaxed, they soon become as numerous as ever. After placing over 75,000 miles of telegraph wire across the length and breadth of Australia for the benefit of commerce, the different governments little contemplated having to furnish hundreds of miles of wire netting to keep out the rabbit plague, besides large sums for supervision and destruction. The annual government outlay on rabbit destruction in Victoria is about 20,000*l.*, in New South Wales 90,000*l.*, and in South Australia 40,000*l.* But this simply represents what is spent on Crown lands. In addition there is the large expenditure incurred by private individuals in attempting to keep their land clear. A fence of wire netting has been erected by the Victorian Government extending a distance of 150 geographical miles, with the view of keeping the rabbits and wild dogs on the border from crossing, and the South Australian Government is doing the same. The sum of 150,000*l.* was placed on the estimates in Victoria last year, for the purchase of wire netting to be handed to settlers on easy terms of repayment; it costs from 18*l.* to 20*l.* a mile. In the last ten years the Victorian Government has paid out 177,000*l.* for rabbit extermination. Some persons have advocated the introduction of animals hostile to rabbits, such as ferrets, weasels, and ichneumons, but where this has been tried, it has been found that the introduced animals have been so destructive to poultry that the rabbits were the lesser

evil of the two. M. Pasteur's scheme of infecting the rabbits with the itch or scab, has been tried and failed.

For the information of persons who are not fully aware of the prolific nature of rabbits, it may be stated that in three years, under favourable circumstances, two pairs of rabbits, if undisturbed in any way, and sufficient food abounded, would increase to the enormous number of 5,000,000; which fully shows the necessity that exists for continuous and vigorous action to destroy them. The extent of the evil may be imagined from the fact that 15,000,000 rabbit skins have been exported from New South Wales in one year, and that in the thirteen years ending with 1889, 39,000,000 rabbit skins were exported from Victoria, to say nothing of the other Australian colonies. Twenty years ago there was not a single rabbit throughout the length and breadth of New Zealand. Since then more than 106,000,000 rabbit skins have been exported from those islands. The property destroyed by the rabbits is estimated by millions. On the average, 12,000,000 skins are exported from New Zealand yearly. They increase so rapidly, and the destruction wrought by them is of such a character, that in some districts it has become a question whether the colonists with their flocks and herds should vacate the country, or whether systematic efforts should be made to extirpate the pest.

In some Australian colonies the bounty offered ranges from 1*d.* to 1*s.*, according to the number in the district. In Victoria there are a hundred official inspectors and some 10,000 persons employed in killing them. Any person having a live rabbit in his possession is liable to a penalty up to 100*l.* on conviction.

In view of these animal scourges and pests which prevail in other countries, we may be content to bear patiently with our variable climate, where we possess many comforts, and with good food and salubrious dwellings enjoy an increasing degree of longevity.

POND LIFE STUDIES.

No. III.—CYPRIS TRISTRIATA.

By H. DURRANT.

AS with Cyclops and Daphnia, the little animal whose name heads this short paper is quite common, and belongs to the same order, viz., Branchiopoda. General: The shell of Cypris is composed of two pieces united along the dorsal margin by a hinge, and bears a great resemblance to a bivalve shell. Feet: Two pairs. First pair stronger than the second, directed forwards, hooked, four-jointed. Second pair situated on the middle of the ventral surface, directed backwards, curved, hooked. Their use is mainly in supporting the ovaries, and are very rarely seen beyond the valves. Superior antennæ not so long as body, setaceous, composed of seven or eight joints, the last are shortest, terminated with from twelve to sixteen fine hairs, which serve the insect in locomotion. Inferior antennæ leg-like, with a tuft of feathery filaments, five-jointed, last joint with several curved hooks. Mouth parts composed of a labrum, which is carinated, shaped like a hood, and projects between the inferior antennæ. A labium slightly elongated and triangular. Two mandibles, toothed, furnished with a three-jointed feeler. On the first joint of this latter organ, a branchial lamina, five parted, occurs (interior lip of Ramdohr). First pair of jaws consist of a basal plate, with four movable finger-like silky appendages at their extremity; from the exterior edge there arises a large branchial lamina, pectinated with nineteen spines. Second pair of jaws, two-jointed, flattened, terminal one furnished with a few rigid hairs and a lateral palp-like process. Abdomen consisting of two long portions, with a couple of terminal hooks and a third at the upper edge.

Specific: *Cypris tristriata*, Müller. Carapace oval, slightly reniform, green, covered with short hairs. The ovaries form two large vessels on the posterior side of the body and opening at the anterior portion of the body. The canal formed by the tail establishes a communication with them. They are conical and simple. Eggs spherical. No distinct joint in the body, which at its posterior termination is formed into a sort of tail with a couple of setaceous filaments fringed at the end with three minute hairs. The lower lip is composed of a sort of compressed sternum (external lip of Ramdohr).

Life-history.—When the time of egg deposition arrives, the female lays them in a mass on the water-plants or very often on the bottom of the pond or ditch, and in doing so uses a glutinous substance, by means of which they are firmly fixed to their support. The occupation of egg-laying is one which takes considerable time in this little species, two or three hours being required for the deposition of about twenty eggs, and all this time she is anchored by her second pair of feet to guard against being swept away bodily by the force of the water. In swimming, the members of this genus use the filaments of the antennæ, sometimes only using one, at other times the whole lot. The first pair of feet also assist the animal greatly, although when they come to be used for journeying over water-plants, etc., it seems they are of very little use, and progress is slow. Besides being used as organs of locomotion, the filaments of the antennæ are thought by Latreille to be used as organs of respiration, a very probable theory.

Here are some notes I made last year on the moulting of this species:—

April 30th.—A female deposited eggs to the number of twenty-one. The time occupied was exactly one hour and three quarters. Immediately after deposition she changed her skin.

May 6th.—Moulted again, and also on the following dates: May 12th, May 17th, May 23rd, and May 27th. Six changes in less than a month. Jurine made a similar observation, and found that between April 12th and May 18th five moults had been undergone.

After the last moult of the one I had under observation, another deposition of eggs took place, a batch of twenty (there may probably have been more, I am not certain) this time, without the intervention of the male. This procedure was followed by a period of lethargy. I then turned my attention to the young. When they are born they are exactly like their parent and by a series of moults gradually attain adult size. Many observers, however, state that the young Cypris undergoes metamorphoses; but I must confess I have never been able to distinguish them as yet, and until I do, must necessarily have the opinion my own eyes warrant me.

Desmaret, an excellent observer, also avows that they do not undergo metamorphosis, but present on their exclusion the identical appearance miniatured, they are to preserve throughout life.

The first batch of eggs my Cypris deposited I solated for the purposes of studying the development within the egg itself, and was surprised later on to find that the females reproduced their kind freely. The ova, young and adults, had been rigorously kept apart, and the intervention of a male was quite impossible. I made many other experiments to the same end, but noticed that after the first batch the rule did not hold good and reproduction was at a stand-still. I am still engaged on the same subject and have purposely refrained from saying much here, as it is one that deserves a whole article to itself.

In summer, when the pools dry up, they bury themselves in the mud, where they remain until the welcome rain once more gives them freedom. Müller and Strauss say that the greater number of non-parasitical Entomostraca live upon vegetable and not upon animal matter, and the former states that while keeping a number of species of Daphnia, Cypris, Cyclops, etc., the water in which they were kept evaporated from five inches to one inch. He subjected at various times dips from this water to a thorough microscopical examination, and found not the slightest trace of animalculæ, though the intestines of the Entomostraca were full, thus proving that they had not fasted.

I have always found the Cypris very carnivorous, and in fact could not keep them in the same vessel with other species of Entomastraca, and have been unable to keep them any appreciable length of time without a supply of animal matter. When I have done so, they have gradually become lighter in colour and almost transparent, until at last they became languid, and would allow a dipping-tube to be placed in close proximity to them without showing the

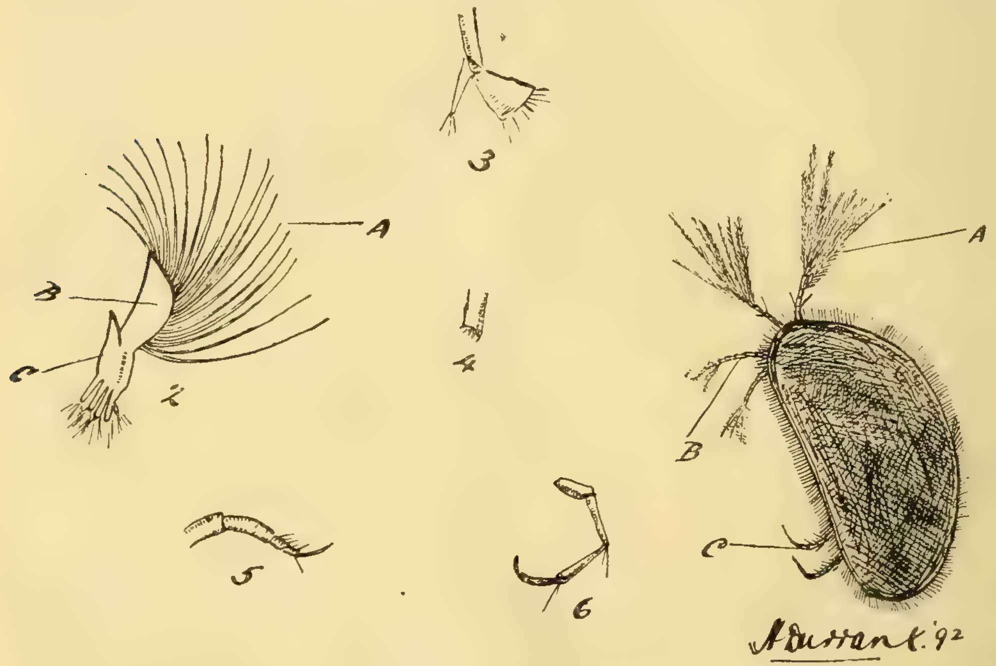

Fig. 154.—1, *C. tristriata:* A, superior antennæ; B, inferior antennæ; C, first pair of legs; 2, first pair of jaws; A, row of nineteen spines; B, branchial lamina; C, basal plate; 3, second pair of jaws; 4, mandibles; 5, first pair of legs; 6, second pair of legs. (All greatly magnified.)

slightest sign of alarm. A short time after they would be found dead. It is my firm conviction, and I state it not without many observations and experiments, that the majority of the Entomostraca are primarily carnivorous, and only necessity, the mother of invention, as our copy-books used to tell us, forces them to a vegetable diet.

STAMMERING AND STUTTERING.

AT a recent meeting of the Manchester Elocutionists' Association, Mr. J. Spence Hodgson, the president, spoke of stammering, which, he said, belonged to civilisation, on the testimony of Catlin among the Indians of North America, and Livingstone and Cameron in Africa, who stated that it was unknown in uncivilised nations. In Europe peoples like the Spaniards and Italians who possessed an easy-flowing musical speech, did not stammer, while in Germany stammering was frequent. Indeed in all the Teutonic languages there were cognate words to the Anglo-Saxon "stamer." The mention of stammering went far back in literature. It was found three times in the book of Isaiah. Shakespeare in "As You Like It," made Rosalind desire that Celia could stammer. Dryden spoke of "stammering tongues and staggering feet;" Cowper of "children stammering out a syllable." The habit was more common in men than in women, in the proportion of three men to one woman. In the population of Great Britain the proportion of stammerers was three in 1000, and in the United States five in 1000, which latter number was nearly three times greater than that of the blind, deaf, and dumb as given in the official Census. Stammering and stuttering were thought by many to be one and the same thing. There was this difference, that the former had relation to vowel sounds and the latter to consonants in connection with vowels. Stammering was more often due to defective formation of the pharynx, palate, or tongue, and was unassociated with faulty muscular movements, while stuttering was due rather to spasmodic muscular contractions and seldom to defects in organs of speech. A stutterer would be influenced for the worse if looked at or by anything that made him think of his defect, or even if he heard another stutter. The habit began about the fifth year and increased to the tenth. Children suffered considerably at school from the habit of stammering, which mostly arose from physical or nervous weakness, aggravated by the fear of ridicule and the dread of observation, and particularly by being made to read aloud before other children. Teachers should avoid letting such a child read before the class (a practice very seldom done), but should allow it to read by itself to an older scholar, or let it sing-song away in an empty class-room. The most inveterate stutterer in the class when he (the speaker) was at school, could read straight along when in a room by himself. The boy grew entirely free from it as he became a man. The causes of stammering and stuttering were mainly functional and not organic. Though there might in some cases be primary and removable causes in the defective organization of lips, palate, tonsils, and uvula, yet the principal causes were a want of control of the organs of breathing, or an affection of the nerves and a low tone in the system. Thus a stammerer would speak better in cold weather and when in good health, and after easy exercise in the open air. As to the cure of the habit, the teacher should first see that the pupil breathed correctly through the natural passage, the nose; that the lungs be thoroughly filled with air by regular inhalation and emptied under proper control during speech, and that no air escape before vocalization. Articulation should be particularly attended to. It should be begun in a whisper, carried forward in a low voice, sometimes in a drawl, then in a sing-song intonation with every modulation—all very slowly, easily, and distinctly. Exercises should be given on the most difficult consonants and sounds, and great patience must be exercised till the pupil mastered them. Care should be taken that muscles be not twitched or used that were not wanted in speaking. It was a help to the pupil if the teacher read aloud with him, the two voices being in the same key, so that the rate and easy flow of sound might be regulated. Passages with long-sounding vowels, as in "Paradise Lost," would be found easier than dramatic pieces with quick conversations, and reading from the Psalms better still.

THE CLOUDED YELLOW.

PROBABLY none of your readers will doubt the soundness of Mr. Creaghe-Haward's opinion, that the recent burst of Clouded Yellows over England must have been produced by the hibernated specimens, of which he had observed a number during the spring months. I believe that similar bursts will generally prove, on investigation, to have been similarly heralded. For instance, in 1876, this butterfly occurred abundantly over a considerable part of Ireland, including the county Wexford. It had before that year been totally unknown to me, and I well remember the pleasure afforded me by the first sight of one of these golden beauties, as he scudded by me at a pace which made the thought of pursuit ridiculous. This was towards the end of May. I saw several other specimens in June; then they ceased to appear, until about the beginning of August, the butterfly suddenly came out in such profusion, that one might have captured almost any number, merely by walking through the clover-fields, and picking them up between the finger and thumb. I could not doubt that these were descendants of the

hibernated insects seen earlier. It is curious that 1876 (the only great Edusa year which I have known), was not distinguished by any "burst" of the species in England, but that the following year (1877) was a great Edusa year in England, while here it produced only a few specimens. The progeny of the 1876 swarm, however, continued to show itself in steadily diminishing numbers, during three consecutive summers, since the last of which I have seen altogether two specimens, one in July, 1887, and one on Sept. 30th, 1892. I may also remark that my experience in 1876 quite coincided with Mr. Creaghe-Haward's in 1892, as to the immensely superior numbers of the male sex. I think ten to one would not be too high—at any rate not much too high—an estimate. This scarcity of the females, if general, will serve to explain in some measure, how such remarkable outbursts of Edusa, as those under notice, have been immediately followed by years in which the same insect was by no means unusually abundant.

C. B. MOFFAT.

Ballyhyland, Co. Wexford.

MOTHS AND SALLOWS.

MR. J. R. HOLT'S more recent notes remind me that his communication under the above heading, which appeared in SCIENCE-GOSSIP for January, has elicited no response. Mr. Holt thinks the relation of the moth to the sallow unsatisfactory, in the present state of our knowledge, and the two difficulties which he brings forward have proved their formidableness, by the length of time they have held the field. But considering the situations chiefly affected by willows, I cannot think them good subjects for unaided wind-fertilization. Moths well-dusted with the pollen might, I submit, materially aid the wind in its fertilizing mission; since, on their mounting into the air, the pollen shaken from their plumage, would manifestly have a very much improved chance of being wafted to a distance. Here, however, I am confronted by the tough part of Mr. Holt's conundrum; for at first sight it seems absurd to maintain, that the sweet secretion attracts moths, that they may carry the pollen upwards in their flight; and yet, in apparent defiance of its own purpose actually stupefies the moths, and keeps them stationary. To extricate ourselves from this entanglement, it is necessary to consider how a moth would probably act, were it attracted to the willows and not stupified. I apprehend that, having once arrived at a tree laden with flower, the moth would merely flit from catkin to catkin, disturbing pollen enough to fertilize a forest, yet doing little or no good—none, that is, beyond what the lightest breath of air would have an equal chance of effecting. Indeed, as the pollen of a willow is totally wasted unless it reaches one of the opposite sex, and as the Noctuæ generally delight in still weather, and would consequently cause the greatest displacement of pollen on the very nights when it was least likely to be borne to any appreciable distance, it appears to follow that a host of moths would, under such conditions, be rather objectionable than desirable visitors. From this point of view I conceive the narcotic property in question, to have been acquired as a security against waste. The moths continue under its influence only for a few hours, and, having passed the night on the sallow-catkins, towards morning recover from their drowsiness and wheel away, each scattering his little cloud of dust to the light breeze. And bearing in mind how a willow in full season is sometimes crowded with these "filmy shapes that haunt the dusk," I think we have little reason to doubt that their dispersion, at the close of a revel, constitutes a not unimportant stage in the somewhat complicated story of willow-fertilization.

C. B. M.

SEXUAL SELECTION.

THIS I take to be but an emphasised phase of a propensity, the existence of which, in some degree, is abolutely indispensable to the origination of any new species. For it is admitted on every side, that the tendency to originate a new species must be defeated, if the individuals which have begun to develop specific differentiation, long continue to mate with those of the older form, from which they are an offshoot. Now, though a species may be spoken of as descended from an ancestral pair, it cannot be assumed that the deviation from the type which characterises the offspring, simultaneously occurred in both the parents. On the contrary, it should be supposed to have occurred only in one. Let us suppose a case in which the deviation occurred in the male, and it follows that the first female ancestor contributed nothing to the evolution of the species, beyond transmitting to her daughters the predisposition to admire males fashioned after the pattern of her own spouse. Have we not here the force of sexual selection brought immediately into full play? And supposing the deviation to occur in the female, would not the permanence of the species require the development of the same force? This, it appears to me, might be effected in one of two ways. The simpler but far less usual course would be for the female to reverse the rules of courtship, and take the initiative herself, as in the example of the grey phalarope; in that case, of course, the distinctive marks of the species would be more strongly developed in the female than in the male. According to the more probable order of events, the variation in the female would, I think, remain a mere precarious variety in that sex, until the peculiarity

should happen to be transmitted to some male descendant. This might, of course, fail to occur, as is shown by the existence of such well-established, but unisexual varieties as *Helice* and *Valezina* in our own insect fauna; but it seems unreasonable to doubt that its occurrence would be more or less likely. In the main, then, I think Mr. Holt right in his limitation of the true scope of sexual selection: but it seems to me possible that a species might be formed by sexual (in co-operation with natural) selection, where the peculiarity admired in the original male, though associated with qualities of direct advantage to him, is not in itself of such advantage.

C. B. MOFFAT.

ON SOME MOSS-DWELLING CATHYPNADÆ; WITH DESCRIPTIONS OF FIVE NEW SPECIES.

By DAVID BRYCE.

IN my last communication I described two species of Cathypnadæ, which I had found in some number, in water obtained by squeezing handfuls of wet sphagnum. I now furnish descriptions of five more species of the same interesting family, also found associated with this and other wet-loving mosses. Of these new forms, the two species of Monostyla are the most important.

The genus to which I have referred them, has been an extremely well-defined one, possessing, in the single, more or less styliform toe, an obvious characteristic by which its members are readily to be distinguished from the other Cathypnadæ, and the variations exhibited by the various species, have ranged between comparatively narrow limits. Both the new forms step outside the old lines, and in two very distinct directions. In the first, the styliform toe, in place of being furnished with the single claw, which normally terminates it, is provided with a pair of claws set side by side, yet slightly diverging, and apparently incapable of motion independently of each other, or of the toe. The two claws seem to indicate a connecting link with the genera Distyla and Cathypna, though whether the structure marks an advance towards, or a retrogression from these, it would probably be rather unprofitable to discuss.

The second species is still more surprising, for it shows a relationship to quite another family, in having a corona protected by the glassy hood-like shield, so characteristic of the Coluridæ.

Among the new Distylæ, the species *agilis* is noteworthy, on account of its minute size, the extreme delicacy of its parts and the untiring vivacity of its movements.

All these species, and many others will live for weeks and months in sphagnum, kept in a cool place in a tightly corked bottle, without any water save that clinging to the moss when gathered. I had, up to the end of May, one such bottle containing sphagnum, collected in August, 1891, at Sandown, Isle of Wight, from that little patch of boggy ground beyond the Waterworks, where the sundew grows in profusion. When first put into the bottle, the moss was wet, as it usually is, and remained wet to the touch, but no more. It had considerably decayed, and had become brown and sodden. Yet if a stem were placed in water, one might at once see several species of Rotifera in full activity. In May the most numerous was *Distyla clara*, but that species has now disappeared, although other species of Rotifera are (in October) still represented. There is here, no question of the creatures having been partially dried, and resuming activity on being moistened with water. Nor can we suppose that the Distylæ seen in May, were the identical specimens in the moss when gathered. The point of interest is, that, with the exceeding scanty supply of fluid afforded by the wet moss, and living probably, directly or indirectly, on the nutriment afforded by the decaying vegetable matter, such delicate creatures as these minute rotifers have been able, not only to survive, but even to continue their respective species for many generations. Without doubt, the extremely slow decay of the moss is in their favour. Ordinary water-plants, kept in a corked bottle with but little water, would probably ferment and quickly go black, and I think that no rotifer could endure that.

On the other hand, I have hitherto but rarely induced any of these forms to live more than a day or two in water, in which I had "washed" threads of moss. So difficult is it to hit the happy medium, between rendering the water foul and not providing it with sufficient nutrient matter, or between poisoning and feeding the rotifers.

On one occasion I was more fortunate; a few individuals of *Distyla inermis*, survived their plunge into the ocean of the zoophyte trough. A colony was founded, and throve, until I depopulated it by emptying the trough and forwarding the contents to a correspondent. I refilled the trough with water, and in a few days began to find the species again, hatched out from eggs fastened here and there to the glass. In a fortnight or so, I was able to send off a second parcel, and I was hoping to get a third, but about this time the trough began to leak, and one evening I found it empty and dry.

Distyla clara, n. sp.

Sp. Ch.—Form a long ellipse. Lorica stiffly membranous, without markings, very transparent. Head broad and blunt. Anterior part of trunk usually distinct. Toes nearly one-fourth of total length, slenderly blade-shaped, tapering, without claw or shoulder, slightly decurved. Brain short; eye absent. Dorsal plate moderately arched.

The broad blunt head, the almost simple tapering

toes, the short brain and the apparent absence of an eye, are sufficient characters to show how very distinct this species is.

The lorica is so delicate that I have failed to define the respective outlines of the dorsal and ventral plates, or the depth of the sulcus. The internal

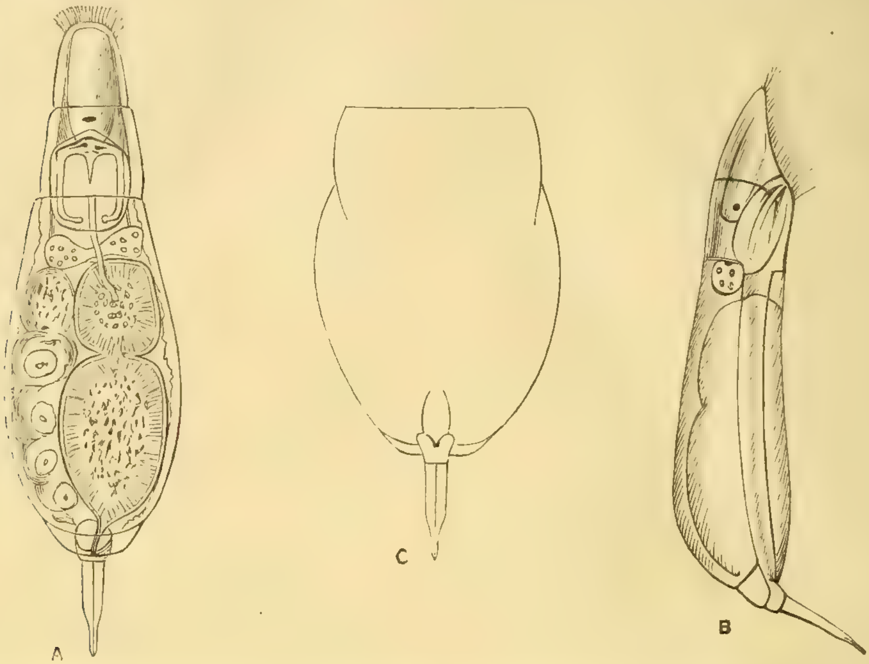

Fig 155.—*Distyla agilis:* A, dorsal view, extended; B, lateral view, extended; C, ventral view, retracted. × 540 diam.

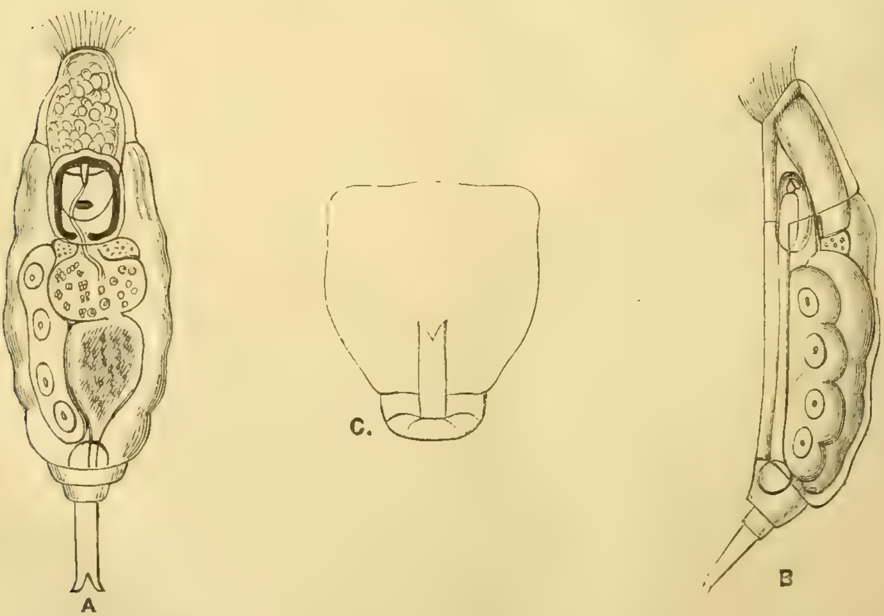

Fig. 156.—*Monostyla bifurca:* A, dorsal view; B, lateral view; C, ventral view, retracted. × 650 diam.

The head and the anterior part of the trunk are nearly parallel-sided, but behind the trunk swells to a graceful oval, terminated by the oblong shield-plate.

organs are generally normal, but the mastax seems broader and more powerful than usual. As in *Distyla depressa*, there appear to be two small and

very delicate horn-like pieces, apparently connected with the teeth of the mastax, which may be seen to open and close as though biting. It is probable, that their function is auxiliary to that of the jaws proper, but their motion is, I think, independent of these. That small area of the ventral surface, which I call the hinge-plate, is of unusual form. Dilating above the usual blunt point to about the normal width, it thence narrows to a blunt anterior point, having thus the outline of a spear-head. So far as I can make

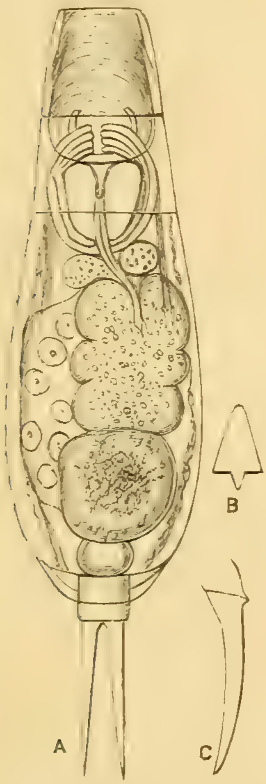

Fig. 157.—*Distyla clara:* A, dorsal view; B, hinge-plate; C, toe, lateral aspect. × 640 diam.

out, the foot is in no way attached to the shield-plate. I have never seen the creature assume the retracted position, even in death. It will withdraw the corona and partially retract the head, but that appears to be all, and is done only for the briefest periods. The lorica seems to be only stiff enough to constantly assume the outline shown and the dorsal plate is distinctly and gracefully arched. Quite devoid of markings or folds, it is extremely transparent and delicate. I never find empty loricæ, and conclude that these decay as quickly as the soft internal parts.

The animal, although always on the alert, is quieter and more sedate in its habits than some of its relatives, and it swims readily enough in a steady manner.

The species was fairly plentiful in sphagnum, gathered last August at Sandown (I.W.), but I

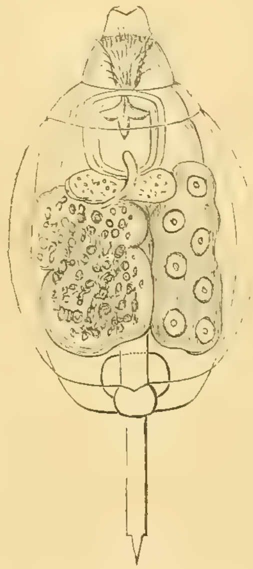

Fig. 158.—*Monostyla galeata,* ventral view. × 575 diam.

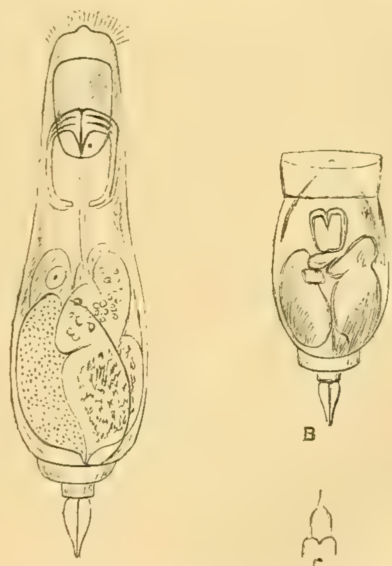

Fig. 159.—*Distyla agilis:* A, dorsal view; B, ditto, retracted; C, hinge-plate. × 520 diam.

have not yet met with it elsewhere. Length, about $\frac{1}{180}$ inch.

Distyla agilis, n. sp.

Sp. Ch.—Small but of elongate form; lorica membranous throughout. Anterior margins gaping

in retraction; head long and narrow; anterior part of trunk distinct. Toes short, rarely separated, somewhat blade-shaped, but obscurely shouldered on outer edge, claw one-third of toe, slightly deflexed.

The length of mature specimens is not much less than that of *D. inermis.* but the creature is decidedly narrower, and so delicate in its appearance, that when the alimentary canal is not gorged with food, it can only be distinguished from neighbouring objects by its movements. I have never observed it to swim, but it glides about with much vivacity and many contortions. Indeed, at first sight, I took my earliest specimen to be a Diglena (of the *permollis* section), and not until I got a $\frac{1}{4}$-inch objective to bear upon it, did I recognise that it belonged to the Distylæ. In its quickness of movement it almost rivals *Stephanops stylatus*, in company with which it occurred, and it was no easy matter to distinguish between young specimens of the two species. The shape of the toes and the outline, both in retraction and extended, sufficiently distinguish it from *Distyla Hornemanni*, while the front, gaping in retraction (so that the outline of the opening is almost a rectangle, scarcely longer than broad) separates it from all other described species, apart from other peculiarities.

The long head narrows suddenly to a blunt point, overhanging the oblique face. A faint constriction marks off the anterior part of the trunk, and this part is almost entirely occupied by the mastax when in its normal position. The greatest breadth of the body is just behind the centre. The lorica, while generally very membranous, is apparently a shade stiffer towards tbe edges, as I have seen short lateral points when in extreme retraction. There is no trace of markings or folds, and it is impossible to assign any definite outline to the dorsal or ventral plates. I believe that the sulcus is very shallow. The shield-plate over the foot, and the hinge-plate on the ventral surface, seem to be the only shelly portions of the integument. The produced anterior point of the hinge-plate is, I think, peculiar to this species. The mastax is stout and scarcely so elongate as usual. The brain is long and apparently simple, and a minute red eye can just be defined. Between the mastax and the stomach is usually a clear space, crossed only by the œsophagus, which is rather long, and exhibits the customary rhythmical undulating movement. The stomach, intestine, gastric and foot glands seem normal.

The toes in the living specimens watched, were never observed to be voluntarily separated for the briefest period, and I only saw them slightly apart in a specimen accidentally crushed. They were then seen to be somewhat blade-shaped, somewhat rod-shaped, and in lateral view slightly decurved.

Numerous specimens occurred among sphagnum gathered in February, 1891, in Epping Forest. Length, about $\frac{1}{185}$th inch; toes about $\frac{1}{2000}$th inch.

Distyla inermis, n. sp.

Sp. Ch.—Small, but of elongate form; lorica membranous throughout, anterior margins appressed in retraction. Head long and tapering; anterior part of trunk distinct; toes short, somewhat blade-shaped, but obscurely shouldered on outer edge; claw one-third of toe, tips very slightly reflexed.

The points selected for the above technical description of this species correspond, with but three exceptions, to those assigned to *D. agilis*, and the figures given of the appearance in dorsal view of the two forms, may be thought to indicate that they are but varieties of one species. In their elongate outline, in the shortness of the toes, and the comparative softness of that covering which scarcely merits the name lorica, they are certainly near to each other, and distinct from their congeners. It is only necessary to define more particularly the characters by which *D. inermis* may be unfailingly distinguished from *D. agilis.* It is a shade longer and decidedly more robust; the face is almost prone, not oblique; and the tapering head is rounded in front, not pointed. The toes, though short for a Distyla, are proportionately longer, and usually, but not invariably, appressed, and the claw-tips have just begun to turn upwards. The shield-plate above the foot is less square. The lines marking the lateral edges of the hinge-plate, are slightly curved inwards anteriorly, and in one case, indeed, appeared to me actually to meet, yet there was no produced point as in *D. agilis.* The lateral infold was very shallow, and although moderately broad, could only be defined in side view and in a favourable position. The tapering claws are flexible, bending from their bases or from points nearer to their tips, according to pressure applied.

Specimens kept in captivity laid eggs freely, attaching them simply to the surface of the glass. They appeared to be double-shelled, but hatched out in the course of a few days. The outer shell measured $\frac{1}{320}$ inch longest diameter, the inner about $\frac{1}{8}$th less.

In retraction the anterior margins of the lorica are appressed, and there is a definite outline recurring after each muscular contraction.

The species swims readily enough, but prefers to glide quietly among the floccose sediment, nibbling at the particles of food. While thus feeding, its contortions are frequent but not violent, and it is most unwilling at any time to completely retract its anterior parts, or to remain retracted, and when it has assumed this position I have never seen any indication of lateral points.

Plentiful in sphagnum from Sandown (I.W.), and in another moss from one locality in Epping Forest. Length, total $\frac{1}{160}$ inch, toes only $\frac{1}{1150}$ inch, or about one-seventh of the whole.

Monostyla bifurca, n. sp.

Sp. Ch.—Elongate, free from wrinkles. Lorica membranous; in retraction anterior margins slightly

convex. Toe of moderate length, straight and terminated by two diverging, curved and seemingly immovable claws.

When extended, this species is rather like *M. mollis*, as figured by Mr. Gosse, but the bifurcate toe distinguishes it readily from that, and from every other species yet described. It can scarcely be said to possess a lorica, save that it assumes in retraction a definite broadly ovate outline. The internal organs seemed normal. The head is stout, but tapering and rounded in front, above the almost prone face, and an ample brain descends behind the mastax, bearing a very conspicuous eye. The trunk, both in dorsal and lateral view, presents a slightly waved outline. The foot-joints are stout, the lower rather broad for its length, and the toe, almost parallel-sided viewed from above, is seen in lateral aspect, to taper gradually from the base. There seemed to be a slight median depression on the toe, just above the tip, but not a definite line, such as would indicate the soldering together of two toes.

Three specimens only of this peculiar form occurred in moss stripped from a branch partially submerged in a ditch near the Waterworks, Sandown (I.W.), in August, 1891. Length, extended, estimated at $\frac{1}{220}$ inch.

It swims quietly and steadily, or crawls about, nibbling as it goes, and contorting itself violently all the while.

Monostyla galeata, n. sp.

Sp. Ch.—Ovate in outline. Lorica distinct without markings; in retraction anterior margins nearly straight; head furnished with protrusile shield, hook-like in lateral view. Toe styliform, of moderate length, shouldered, with single claw.

I found numerous dead examples and empty loricæ among washings from sphagnum, gathered in July and August, 1891, at Sandown (I.W.), but passed them by, as being probably a small variety of *M. lunaris*, distinguished by its smaller size, and its straight anterior margin of lorica in retraction. Some months later I found, in a washing from the same moss, a living specimen, and I then discovered that it possessed the striking peculiarity of a frontal shield-like hood, exactly like that figured by Mr. Gosse in Colurus.

I was unable to get a good view of the internal structure, as the creature was very lively, and shortly after its discovery was lost at the edge of the cell. I found later, that a dead specimen which I had preserved, showed the hood half protruded.

The dorsal plate is, as in most of the Monostylæ, broader than the ventral. The shield-plate is broad and rounded behind, while the hinge-plate shows the usual parallel lines, and the lower foot-joint is rather bead-like in outline. Length, about $\frac{1}{200}$ inch extended; toe and claw, about $\frac{1}{800}$ inch.

CASUAL AND ALIEN PLANTS.

ATTENTION having been called in a recent number of SCIENCE-GOSSIP, to the occurrence of *Ornithopus roseus* and *Coronilla varia* in a sub-spontaneous manner, I beg to enumerate a few more examples of casual plants which have come under my own personal notice. These have mostly been noticed in short rambles near large towns, where business pursuits prevented botanising in the country, except at long intervals. A few instances only are mentioned of casuals in the more rural districts. *Eranthis hyemalis*, Salisb., perpetuates itself in a plantation near Crosby Court, North Yorkshire, where it may, however, have been planted. *Papaver somniferum*, L., is a frequent casual at Scarborough, Aintree (Lancashire), and about York, but is always sporadic in its appearance. *Corydalis lutea*, grows in profusion on walls at Arden Hall, a bleak spot on the Hambleton Hills, evidently escaped from the hall garden. *Arabis arenosa*, Scop., occurred casually and sparingly on waste ground at York. *Hesperis matronalis*, L., on rubbish-heaps at Aintree. *Sisymbrium pannonicum*, in some quantity on Foss Islands, York, where it may establish itself as it has done about Hightown and Crosby, Lancashire. In the latter district it has more than held its own for many years. *Erysimum perfoliatum*, Crantz; grain-brought at Walton, Lancs. *E. repandum*, on ballast near Birkenhead docks, Cheshire. *Camelina fœtida*, impermanent alien at Northallerton, York, and Leeds, and *C. sativa*, Crantz, on waste heaps at Aintree. *Brassica Erucastrum*, Vill., on ballast at York. *Diplotaxis tenuifolia*, D.C., on rail embankments at Northallerton and Thirsk, where it may establish itself; also in similar situations at Tyne Dock, near South Shields. *Lepidium sativum*, L., a frequent garden outcast, as also *Raphanus sativus*, L. *Dianthus plumarius*, L., grows on the ruins of Fountains Abbey, where it may have been intentionally planted. *Saponaria vaccaria*, L., a few plants at York, and more plentifully at Hightown and Aintree. An increasing species with us, introduced with grain. *Silene dichotoma*, L., was found by Mr. Geo. Webster in cornfields near York, and I have gathered what appears like a form of the same thing in some plenty on ballast at Aintree. *Claytonia perfoliata*, Don., occurs in a plantation and surrounding lanes near Formby, to all appearance thoroughly established. *Malva borealis*, Wall., *M. nicæncis*, All., and *M. parviflora*, Huds., grew together in some abundance where flour-mill refuse was out-thrown at York, and a plant or two of *M. Alcea*, L., were found many years ago at Northallerton, by a roadside. *Linum usitatissimum* is a frequent casual. It was formerly extensively cultivated near Northallerton, when it was occasionally infested with its parasite, *Cuscuta epilinum*. A variety with many stems, and carpels ciliate internally, occurred this year at Aintree, and

may prove to be the var. *crepitans*, Schubl. I have found *Trigonella polycerata* at York, and *T. hamosa* at Birkenhead. *Medicago sativa*, a waif of cultivation, at Northallerton, and *M. maculata*, Sibth., at York, and by the canal at Aintree. A few plants of *M. apiculata*, Willd., grew with the latter at York. *Melilotus alba*, Desr., grows in profusion on Foss Islands at York, and on ballast-heaps at Hunslet and Fazakerley (Lancs.); the yellow-flowered *M. parviflora*, Lam, being equally abundant at York and Aintree. *M. cœrulea*, *L.*, occurred sparingly at York only. These species of Melilotus appear to grow very freely where introduced, so long as competition is limited, but they gradually disappear before stronger native weeds. *Trifolium hybridum* is a common casual, being frequently cultivated. *Ornithopus compressus*, L., a few plants only at York and Walton (Lancs.). *Vicia sativa*, L., frequent, Leeds, Scarborough, &c. *Potentilla norvegica*, L., well established and ineradicable by the canal from Hunslet to Woodlesford. *Œnothera biennis* has obtained a permanent footing on the Lancashire sandhills about Crosby and Hightown. *Caucalis latifolia*, L., nearly a score of plants as weeds in garden-ground at Walton, accompanied by a single plant of *C. daucoides*, and a few specimens of *Torilis nodosa*. *Ammi majus*, a solitary but fine plant at Aintree by the canal. *Aster brumalis*, on ballast at Hartlepool. *Chrysanthemum coronarium* and *C. segetum*, in some profusion on ballast at Hunslet. *C. parthenium*, L., is a frequent garden-escape in many localities. *Silybum marianum*, long known on the Castle Hill, Scarborough. It never grows profusely, and often fails to appear for a year, but still does not altogether disappear. *Centaurea melitensis*, native of S. Europe, is a common casual at York, Leeds, and Huddersfield, but in our climate does not flower freely; frequently the buds never open at all. It is often mistaken for *C. solstitialis*, L, which bloomed well on ballast at Aintree this season. *Anagallis cœrulea*, Schubl., sparingly at York; and what appears to be blue-flowered *A. arvensis*, on rubbish near Aintree. *Amsinckia lycopsoides*, Schm., a frequent wool-waste plant, has occurred about York, Leeds, and Liverpool. *Datura stramonium* and *Hyoscyamus niger* grew together at Aintree, and the latter has also been found at Northallerton. *Linaria cymbalaria* is thoroughly at home on walls overlooking the Ouse at York, where it hangs in luxuriant festoons. *Verbascum virgatum*, a few plants at Northallerton, without permanence. *Mimulus luteus*, in the bed of the river Yore in Wensleydale. *Mentha viridis*, L., is with us always a garden-outcast, the least suspicious locality being Forge Valley, near Scarborough, a long way from any house. *Leonurus cardiaca*, L., on the slope of the Great Orme's Head, towards Llandudno. *Plantago arenaria*, W. and K., very fine on ballast at York, with *Amaranthus blitum*, *Chenopodium opulifolium*, Schr., *C. rubrum*, *C. vulvaria*, and *C. glaucum*, the latter, I believe, a permanent integer of the York florula. *Spinacia oleracea*, L., casually where manure had lain at Scarborough. *Rumex dentatus*, Camp., a native of south-east Europe, fairly plentiful on ballast at York. *Rumex alpinus*, L., very fine by a roadside near Horsforth, Leeds. *Asphodelus fistulosus*, L., in considerable quantity in two places about four hundred yards apart at York, in both situations with *Setaria glauca*, Beauv., and *S. viridis*, Beauv., the latter also growing by the canal at Hunslet. *Panicum crus-galli* and *P. glabrum*, Gaud., both grain-brought at York. *Phalaris canariensis* may be found on heaps of refuse everywhere where birds are kept. *Glyceria distans*, *Bromus arvensis*, L., and *Lolium italicum*, Braun, all three abundant on ballast at both York and Leeds. I have seen all the above in situ, and have specimens of nearly all preserved in my herbarium. It will be seen that although many of our rare plants are threatened with extermination, our flora is being reinforced by fresh varieties. Perhaps most of the above are evanescent, and will disappear without trace, beyond a few specimens in herbaria, but it is evident some at least will hold their own in the fight for existence, which they will have to wage with our native weeds.

In conclusion, I must state that I am much indebted to Mr. Baker, of Kew Herbarium, for kindly determining many of the above plants, some of which are hereby first recorded for the vice-counties in which the localities are situated. I have also received welcome aid on several occasions from Mr. Arthur Bennett and Captain Steuart, which I beg to acknowledge here.

J. A. WHELDON.

SCIENCE-GOSSIP.

THE "nitro-metals" are a new class of compounds recently discovered by Sabatier and Senderens. They have found that reduced copper absorbs, in the cold, the vapours of nitrogen peroxide, heat being disengaged during the process. The product is a maroon-coloured compound, the composition of which is represented by the formula, Cu_2NO_2. This is nitro-copper. A similar compound has been obtained with cobalt. Nitro-copper reacts violently with water, giving off nitric oxide and yielding a green liquid containing copper nitrate mixed with a little nitrite. A residue of almost pure copper is deposited at the same time.

THE popular idea that water is purified by freezing has been again disproved by recent careful experiments, which show that the average amount of impurity retained by the ice is 34·3 per cent. of organic matter, and 21·2 per cent. of inorganic matter. As organic matter is the more objection-

able of the two, the case is worse than was formerly supposed.

MR. SAVILLE-KENT's forthcoming work on "The Australian Barrier Reef," to be published by Messrs. W. H. Allen & Co., judging from the magnificent photographs made by the author, *ought* to be a splendid success.

WE are pleased to call attention to the advertisement of Miss Hele, of Cotham, Bristol, concerning her collection of fossils and minerals, offered for sale. Miss Hele and her sisters are enthusiastic and intelligent collectors, and their collections are full of good things. The fossil carboniferous corals, from the neighbourhood of Bristol (polished) are almost unique for their beauty.

IT is with the deepest regret we have to record the death, at a comparatively early age of life, of Mr. Henry Hailes, the esteemed editor of the "Journal of the Quekett Club," and the foreign secretary of the society. He was an old contributor to SCIENCE-GOSSIP, and an ardent microscopist, especially in anything appertaining to the foraminifera. His genial and kindly manner won him troops of friends.

TREATED chemically, a pound of coal will yield enough magenta to colour 500 yards of flannel, vermilion for 2560 yards, aurine for 120 yards, and alizarine sufficient for 155 yards of red cloth.

THE November number of "The Naturalist" is very rich in notes on entomology and ornithology, embracing hymenoptera and lepidoptera, in the former, and the great snipe, buzzard, Pomerine skua, woodcock, etc., etc., in the latter. There are also long articles on "The supposed inter-breeding of the merlin and kestrel in Northumberland in 1886," by F. B. Whittock; "The Land and Freshwater Mollusca, 1888 and 1889" by Mr. Denison Roebuck, F.L.S.; together with the conclusion of J. E. Tinkler's "Notes on the Avi-fauna of Arkengarthdale, Swaledale, and the New Forest."

THE JOURNAL OF THE ROYAL MICROSCOPICAL SOCIETY for October, contains a very long list of researches relating to zoology, botany, and microscopy. Among the chief zoological discoveries and experiments may be enumerated the "Embryos of Apes," by J. Kollmann, and the "Development of Blood-corpuscles," by O. Van der Stricht. In the botanical notes is a very interesting one on "Iron in Plants," by H. Molisch. Among the Cryptogamia, A. Richter's paragraph on the Adaptation of Fresh-water Algæ to Salt water." is most curious. The plate and woodcuts are well got up, and artistic.

THIS month's "Feuille des Jeunes Naturalistes," comprises Adrien Dollfus's "Notre Bibliothèque;" "The Natural History Objects at Montpellier in 1892 (Botanical)," by Dr. L. Planchon; "Geological Excursions in Alsace and neighbouring Country," by Mathieu Mieg. Then follow communications received, articles on l'Aberration de Deilephia Hippophaës, Fermeture des flacons, Coræbus bifasciatus, questions, and finally a supplementary catalogue of the current works and memoirs in the library.

TRINIDAD FIELD NATURALISTS' CLUB.—The October number of this periodical contains much instructive matter, i.e., "Report of the Club Meetings," First Annual meeting, 8th August; "Club Papers;" "Babiche-shooting in the Caroni." It is a well-appointed little paper, and interesting, as coming from one of our many flourishing colonies.

THE ENTOMOLOGIST'S RECORD AND JOURNAL OF VARIATION.—Dr. T. A. Chapman continues his article on "The genus Acronycta and its Allies" from page 195. Most of the readers' experiences of the past season tend to one point and seem to be guided by one idea, which no entomologist has had out of his head since last July, and that one point centres around the two Colias. Other contents are: Variation, Scientific Notes, Current Notes, Reports of Societies, etc., etc.

RECENTLY the natural history of that dread disease, cancer, has received much attention from physiologists of various countries, who have studied its growth and development by means of the microscope. The results are not sufficiently advanced for any trustworthy conclusions or generalisations to be drawn, but there seems no doubt that cancer is an organic growth. Further, it is all but certain that cancer itself is liable to the attacks of another parasite. Between the cells of the cancer these sporozoa live. They have been found most abundantly in soft medullary cancer. Perhaps, before long a further knowledge of the ways and doings of these parasites may enable us to deal more effectually with the growth of cancer.

THERE are few plants which have attracted the attention of botanists more than those termed "carnivorous," about which the great Darwin wrote one of his most notable books. The idea of plants feeding on animals such as flies, and even birds, was ludicrous, perhaps, because we were not familiar with anything else than animals feeding on plants. The fact, however, is not fully substantiated. We have at least half-a-dozen not uncommon English plants which are carnivorous. One aquatic species even captures, devours, and digests young fish as soon as they escape from the egg. It was even found that these peculiar plants possessed a peptonising power for digestive purposes. Up to the present time the plant has taken the credit for this physiological act; but it has recently been discovered that it is due to the activity of certain micro-organisms which are always present in the sap of the mature plant. For

the development of these minute organisms the peculiar secretion of carnivorous plants furnishes a favourite pabulum or food.

THE Royal Institution of Great Britain has been in luck's way lately. Mr. Thos. G. Hodgkins, of Long Island, New York, has bequeathed to it the sum of $100,000, and the Goldsmiths' Company have donated £1000 for "Original research," etc.

IF Mr. R. C. Chaytor did not "strike ile," by his query as to the calculated capacity of a pipe for a gallon of water, he has been the means of proving (by the number of correspondents replying), how large and keen is the reading *clientèle* of SCIENCE GOSSIP, for it is quite impossible to do other than publish the replies of the first answers opened.

"SAXON and Dane and Norman are we," sang the late Poet Laureate in his Alexandra "Welcome Ode." But we are getting "drefful mixed." All nations are coming to England to get corn—that is, a livelihood. In a comparatively short period our native ethnography will be effaced. Just in the nick of time, therefore, Dr. Francis Galton and other men eminent in the science of ethnography have issued a circular letter on behalf of the committee appointed by the British Association, for an ethnographical survey of Great Britain. It is proposed to record for certain typical villages and the surrounding districts, the physical types of the inhabitants, their current traditions and beliefs, the peculiarities of their dialect, the monuments and other remains of ancient cultivation, and historical evidence as to continuation of race.

OUR big brother planet, Jupiter, is evidently going through the throes of important and powerful physical changes. We must not think of this huge world as being in anything like the same state as our earth, although the latter many millions of years ago doubtless passed through the same stages that Jupiter is now undergoing. Ever since the recent opposition of Jupiter, its surface has experienced many changes. The position and size of the "great red spot" (evidently a part of the planet which has not yet cooled down below the red-hot state) is the chief part studied. Recently this red spot has changed its character, and seemed as it if were about to disappear. A conspicuous black spot has appeared on the edge of the northernmost "belt," whose motions appear to be very similar to those of the "great red spot."

TALKING about Jupiter, its newly-discovered *fifth* moon is exciting the attention of all astronomers as much as a new baby does a bevy of young mothers. It is so very close to the planet that they find it difficult to estimate its real magnitude, but it is probably not more than 100 miles in diameter, and may not even be that. The very fact that such a small world can be seen from the earth, and studied here, shows what wonderful instruments modern astronomers are possessed of, and how accurate must be their methods of observation. This new *fifth* Jovian moon actually makes two revolutions round the big planet in a day. Except the recently-discovered inner satellite of Mars, it is the most rapidly revolving satellite known.

PICKERING & CHATTO'S "Book-Lover's Leaflet" is always welcome to a bibliophile, even if he cannot afford to buy the books whose brief learned notices are so instructive; but the last number surpasses all others in literary interest.

LORD BEACONSFIELD'S famous saying that "Chemicals are looking up," is as historic as Mr. Gladstone's advice to farmers to grow fruit for the jam manufacturers. Both men were right, although both were laughed at. The English jam trade has enormously developed since Mr. Gladstone's address on the subject, and it is very certain that an improvement in the market condition of "chemicals" is not a bad sign of an increased prosperity in other trades.

CONSEQUENTLY it is with much pleasure we note new and vastly improved departure in the manufacture of certain chemicals. Again it is the new science of electricity which has made it possible. One of the most important chemicals used all over the world, is caustic soda. Hitherto, the process of its manufacture, has been slow and roundabout. Now an altogether new method has been discovered, by which caustic soda, chlorine, and other chemical products can be made from the brine directly, by the aid of electricity. The new process is also a more economical one by at least 50 per cent., as compared with any or all of the present methods. It is much simpler, the caustic soda being produced from the brine in one operation instead of two. The valuable chlorine is also saved, and utilised for the production of bleaching powder (chloride of lime), and other by-products. Our most eminent chemists have pronounced this new method of manufacture a complete success, and the chemical industries of the north of England promise well in the future in consequence.

POSSIBLY a new source of wealth will henceforth be found, on account of this new method of electrically decomposing sea-water. Hitherto, the mighty seas and oceans of the world have contributed little or nothing, except a little coarse table-salt, to the world's wealth. Now that electricity can decompose and extract its saline and other salts from it, will it not be able, ere long, so to extract them as to leave the water pure enough to drink? It seems possible! In that case the time may not be far distant, when every ship will carry its own electric apparatus, for separating the chloride of soda, etc.,

from the sea-water, so as to leave pure potable water behind. Then the reader will no longer be able to quote from the "Ancient Mariner"—"Water, water everywhere, but not a drop to drink."

What is the difference between an annual and a perennial plant? A thoughtless person will at once tell us that one never lives more than a single season and the other many. But this is not an explanation, it is only a statement of facts. Annuals are remarkable as being free-flowering plants. We grow many species of them in our gardens, on account of the abundance and beauty of their flowers. Flowering is an act of vegetable expenditure, whereas leafing is one of vegetable accumulation. Annuals are, in reality, plants which expend their substance in riotous floral living and seeding. They wear themselves out in a single season thereby. They have spent all they had, and there is no vegetable surplus left over, to carry them through the winter, and enable them to start business again when spring reappears. On the other hand, perennial plants of all kinds bear more leaves than flowers. They save something out of every summer's existence, and put it into their vegetable savings-bank—as in the increasing size of a tree's trunk, for example. If we could only induce annual plants to be a little more thrifty, a little less lavish, in their floral expenditure, perhaps we could alter their habits of life, and convert them to the perennial condition.

This is what Professor Meehan, a distinguished American botanist, claims to have done, and he has just read a paper on his method before the Philadelphia Academy of Sciences. It is a very simple plan, and consists in cutting down the flower stems as soon as they appear. Thus no expenditure can take place, only vegetable accumulation. An annual plant thereby gets transformed into a perennial, and by continuing to cut down the flower-stem the perennial condition can not only be secured, but possibly may be inherited.

We have to acknowledge an important pamphlet "On the association of shipping disasters with colour-blind and defective far-sighted sailors," by T. H. Bickerton, ophthalmic surgeon at the Royal Infirmary, Liverpool. This is one of those subjects which people in general pass over, and so long as a sailor is able-bodied and active they seem to think him perfection, forgetting that were his sight bad, and a hole left unmended, or a rope not quite as it should be, a puff of wind might come and heel the vessel on her beam-ends, to say nothing of collisions.

We are sorry to announce the death, at the ripe old age of seventy-eight, of Professor Robert Grant, the astronomer—a man dear to everybody who knew him, apart from his vast *répertoire* of scientific knowledge.

One of our liveliest and most successful of scientific societies is the Norwich Science-Gossip Club, which has just issued its twenty-second Annual Report, containing capital summaries of a great variety of papers, read at its fortnightly meeting during the winter months, in addition to the President's Address.

A remarkable achievement in telephony has just been effected in America. This consists in the opening of a telephone line between New York and Chicago—a distance of 950 miles, or nearly twice the length of any previously in regular operation.

The Astronomical Society has received from the Cape of Good Hope a specimen of celestial photography in which there can be counted, by the aid of a microscope, 50,000 stars of various magnitudes. The plate was exposed three hours, and the apparatus regulated by clockwork.

The waste of a great city might easily feed its desperate poverty. We waste our coal and our smoke, our gas and our water, our food and our refuse. What we want is more forethought in times of comparative prosperity, so that the army of hungry children may be smaller, when a season of adversity arrives, and the drink bill may continually lessen and the Balances of the Post Office Savings-Bank continually increase. The chemists turn scrap-iron into ink, old bones into lucifer matches, the shavings of the blacksmith's shop into Prussian blue, fusel oil into oil of apples and pears, the drainings of cow-houses into fashionable perfumery, beggars' rags into new pilot coats, cesspool filth into ammonia, and tar waste into aniline dyes and saccharine. In Paris they first utilise rats to clear the flesh from the bones of carcases, then kill the rats, use up the fur for trimmings, their skins for gloves, their thigh bones for toothpicks, and their tendons and bones for gelatine wrappers.

MICROSCOPY.

Substitute for Canada Balsam.—Your notice in the October number, of a new substitute for Canada balsam would prove not only interesting to your numerous readers, but particularly useful, if you could tell us in a short paragraph in a future issue where we can obtain the gum therein mentioned, in a convenient condition for ready use. We can get supplies from London, if we know where to apply. An older subscriber than myself (I think for fifteen years) is tired of Canada balsam, and asks me to write for the above information. There are several here interested practically in microscopy, and I make it a point to lend my copy of Science-Gossip to one of them. I need not add that we much appreciate your paper.—*Micro.*, *Oporto.*

ZOOLOGY.

ACME LINEATA.—In vol. xix. of SCIENCE-GOSSIP, p. 185, reference is made to the distribution of *Acme lineata*, var. *alba* (Jeffr.), which does not appear to have been found in this country. It may therefore be of some interest to your readers, to hear that I have found this shell near this city, in the same locality as the type, which, however, has only been found by me occasionally, and then only very sparingly. In the list of "South Devonshire Mollusca" of the Exeter district, given at p. 115 of vol. xxv., no mention is made of this shell.—*I. W. D. K.*, *Exeter.*

THE PRESERVATION OF SEA-URCHINS.—I have found that by cleaning out the internal portions, then thoroughly washing in fresh water and drying, the spines do not come off.—*D. Wilson Barker.*

BOTANY.

VEGETABLE SYMBIOSIS.—At the Annual Soirée of Manchester Microscopical Society, Prof. Weiss gave an address on this interesting subject. He pointed out that partnerships for mutual benefit or for defensive purposes are often formed in the animal kingdom, and are also of no uncommon occurrence between plants and animals. Thus the whole group of myrmecophilous, or ant-loving plants, harbour in the hollows of their stems entire armies of ants, which they feed with nectar secreted on their leaves. The benefit to the ant is apparent, and that reaped by the plant is the protection afforded by an army of these honey-eating ants against the disastrous ravages of the leaf-eating ants. These assail almost all trees of the tropics, but are always driven back by the garrison maintained by myrmecophilous plants. Another instance is the occurrence of small green algæ within the tissues of certain animals, such as the freshwater sponge and the freshwater polype (hydra). These green-coloured bodies were long held to be green corpuscles belonging to the animal itself, but have now been shown to be vegetable cells which have been able to be cultivated outside the animal body. As these green cells can form starch and ultimately sugar, which transfuses out of the algæ into the body of the animal, it is evident that they are of great benefit to the animal, while the algæ themselves can absorb certain substances out of the animal cells. An analogous example occurs in the vegetable kingdom in the case of the lichens, in which some green alga is associated with a fungus. Every lichen consists of the two different organisms, and the green cells form, under the influence of the light, food-substances which are made use of by the fungus. In initial stages the fungus can be seen capturing, with its threads, the algæ cells of which it makes use, and which are the working partners of the concern. In another case we have an association of a fungus with a beech or oak or other tree. The roots of these are often found infested with fungal threads or hyphæ, termed mycortiza, which are able to take up the decaying vegetable matter and pass it on to the tree. Seedlings of the oak or beech are unable to grow in decaying leaf-mould, without the aid of such fungi. Here, then, the green plant is the one which derives the greatest benefit, and not the fungus, as was the case in the lichens. Many bog plants, such as the heath and the crowberry, have formed similar partnerships with fungi, the fungal threads making their way into the roots of the plants and living for a time in their cells. Ultimately, however, they are entirely absorbed by the green plant, and the advantage of the partnership to the fungus is not apparent. In the root tubercles, so characteristic of leguminous plants, we find small bacteroids, which have made their way in and which in exchange for some food-matter, which they absorb from the pea or bean, provide it with the necessary nitrates which they can form from the nitrogen of the air. Thus leguminous plants, and those only, which are infected by the bacteroids, can grow in a soil entirely devoid of nitrogen, where no other green plant could possibly exist. Leguminous crops are invaluable to farmers, as they leave the ground stocked with nitrates, when the root tubercles decay. Lastly, a case of symbiosis has recently been discovered by Professor Marshall Ward in the fermentation of ginger beer. Of the many organisms contained in the so-called "ginger beer plant," two only are necessary for normal fermentation—a yeast-like fungus, and a bacterium ant; these are so dependent one on the other that the fermentation they produce may well be called symbiatic fermentation. The yeast cell produces a waste product, which, when accumulated, stops all further action. The bacterium, however, feeds on this waste product, and thus, by removing it, stimulates the yeast-like fungus to renewed activity. Thus both partners in the concern are benefited, and dependent one upon the other.

THE MUDAH AND TOOTHACHE.—I was told by the natives of India, that the milky juice of the mudar (*Calotropis gigantea*), dropped into an aching tooth, instantly relieved the pain, but so loosened the tooth in its socket, that it generally dropped out soon after. This seemed to me so very improbable, that I gave the matter no further thought until a European friend told me he had tried it. He said that there was first a moment of intense agony, then total cessation of pain, and that the tooth actually did drop out a short while after. Accordingly. the next time I had a toothache I tried it myself, with absolutely no effect. The pain was neither relieved, nor aggravated; and the tooth was not perceptibly

loosened; in fact, I have the stump still. Is the property attributed to the mudar entirely mythical, or is its having no effect on me to be attributed to personal idiosyncrasy?—*J. R. Holt.*

DOUBLE-FLOWERED ROSE.—In last month's number of SCIENCE-GOSSIP I notice a letter from Mr. W. H. Grattan, relative to a curious flower of the dahlia. I have never seen this remarkable freak in a dahlia, but I do not think it is very uncommon in cultivated roses. On several occasions I have had double-flowered roses, generally what are known as "tea-roses," sent to me. The last occasion was in August, 1891, when I had two very fine examples forwarded to me from the Isle of Man. In both cases the lower bloom was fully expanded, while the upper, which grew from the centre of the first, was only half open, and somewhat smaller than the other. — *L. Creaghe-Haward, Weybridge School, Surrey.*

"THE BRITISH MOSS-FLORA."—Dr. Braithwaite still manages to find time to bring out his noble work. The fourteenth number is to hand, dealing with Family XV., Bryacea, II., doubtless the most interesting as well as the most beautiful family of our moss-flora. The present number contains six plates, crowded with the characteristic details of the structure of each species, which are as artistically executed as they are microscopically accurate, which is saying a good deal.

VARS. OF BRITISH PLANTS.—I was very pleased to see Mr. Bennett's article on new varieties of British plants, but it would have been much more valuable if accompanied by short descriptions of some of them, which are only described in Exch. Club Reports, or periodicals which dwellers in remote country places are not likely to have access to. Please do not look upon this as a "grumble"—quite the reverse. I think SCIENCE-GOSSIP has never been so useful and interesting as now.—*J. A. Wheldon.*

COLOURATION IN PLANTS.—On reading the interesting paper in the October number of SCIENCE-GOSSIP, on "The colouration of the rose, the violet, and the buttercup," a question occurs to me that I should much like to have answered. Why do some blue-coloured flowers lose their tints in drying, whilst others are steadfast in retaining them? I take two constant examples. It is next to impossible to obtain a dried specimen of the *Campanula rotundifolia* with its colour, which from its stiff, wire-like stem and dry leaves, and its flowers which rattle together on shaking the bunch, you would expect to keep their natural tint, though they completely lose it, leaving the bells a transparent white. Perhaps one may succeed in obtaining one specimen out of a dozen with a blue bell on the plant. All the campanulas are equally disappointing, as far as my experience goes, while the gentians of every sort keep their beautiful full colour even with the most careless drying. I have specimens of the *Gentiana pneumonanthe*, the marsh gentian, dried more than three years ago, and other sorts twenty years ago, dried in Switzerland, all as blue as when they were gathered. Now, what is the difference of these two blue tints? Must there not be a radical difference? A very curious—accident, I must call it—happened to me last summer. I hurriedly put a piece of *Campanula rotundifolia* into the book I had in my hand, between the cover and the fly-leaf, the inner lining and the fly-leaf being of a dark blue-green, and to my surprise, on opening the book a week or so later, I found my Campanula there, and to my greater surprise, the three blossoms and several buds had dried blue! I had then left the country and had no further opportunity of experimenting. I enclose a bit of the fly-leaf. Could the colour or dyeing of the paper have had any effect in the fastening of the blue in the flower?—*I. G.*

GEOLOGY.

THE "GEOLOGY OF LONDON."—Referring to the admirable article on the geology of London, which appeared in your last issue, may I quote a passage from Mr. Whitaker's "Guide to the Geology of London," 5th ed., p. 22, which appears to me practically to settle the question, whether the doubtful beds found in the Kentish Town, Crossness, or Streatham borings, belong to the old red sandstone series or not. He says "There is a reason against the classification of the bottom beds at Kentish Town and Crossness with the old red sandstone, which seems to have escaped notice before the publication of the 3rd ed. of this work. Having that series unmistakably present in the Devonian type at Cheshunt and at Meux's, it would be strange indeed were it to occur in its wholly distinct old red type at Kentish Town, between those two places, and at Crossness, not many miles from the latter of them. I believe that such a thing is, at all events, very unusual, the two types of what is generally taken to be one great geological system being limited to separate districts, and not occurring together," *et seq.* This is certainly a very forcible argument, and if we accept it as practically conclusive, the point at issue is narrowed down to a decision between the carboniferous and triassic ages. The former of these appears to be out of the question, so that there is nothing for it but to class the doubtful beds as triassic. In doing so, however, in the absence of positive proof, we should of course, have to be prepared for a surprise, should a subsequent boring show that this is really a very exceptional case.—*Llesba.*

NOTES AND QUERIES.

CLOUDED SAFFRON BUTTERFLY (*Colias edusa*).—This butterfly, usually so rare in this neighbourhood, that I have only seen one during the last ten years, has been very plentiful this year, and quite a common object on the road sides. It is singular, however, that all, or nearly all, of them are *males.* I have not seen a single female during the whole season. Can any one explain why this is?—*George Avery, Tenterden, Kent.*

DOG BAYING AT THE MOON.—I had read of this in poetry and folk-lore, but it was not until early in September, while walking in a street in Dunoon, that I actually witnessed it. The street was in shade, and a shepherd's dog was trotting before me. Suddenly, at a turn, the full-orbed moon, rather low in the horizon, was visible. The dog immediately stood, gazed at it, barked for two or three seconds, and then uttered a long whine.—*J. Shaw, Tynvon, N.B.*

A FLOCK OF GOLDFINCHES.—I have been bird's-nesting in the shires, but a living specimen of the *Fringilla carduelis* has never come to twit me. Of a spring morning in the south of France, I opened my eyes, and beheld mother goldfinch sitting upon a tree; and now, in chill October, when walking over a piece of waste ground on the outskirts of Geneva, I have had the delight of seeing a flock of some thirty youngsters. The thistle-eaters were gathered like chicks around a scrubby clump of *Centaurea calcitrapa*, and on being aroused, they flew over a wall, and returned to social feelings true.—*A. H. Swinton.*

ABNORMAL CYCLAMEN.—I send you herewith a specimen of the Cyclamen, in which the flower-stalk has developed leaves, become fasciated, and having two flowers on it, the one underneath the small curled leaf at top has withered, the other will, I think, open out.—*A. F. Steed.*

DISTURBING THE BALANCE OF NATURE.—Sable Island, near Nova Scotia, was overrun with rats, and the lonely islanders, whose chief duty is the relief of shipwrecked mariners, imported a cargo of cats from the Canadian mainland. The cats did their work of slaughter so well that they soon had to fall upon the rabbits for food, and themselves became so plentiful that an importation of foxes had to be made to keep them in check. The foxes, like the cats, did their work too well. They not only destroyed the cats, but killed all the young birds and destroyed thousands of eggs. Tired of the warfare, the islanders are now appealing to the Government to exterminate the foxes. Montreal has a famous hunt, and they are being urged to come to the relief.

COLLECTING AND MOUNTING SPIDERS.—Will some obliging reader of SCIENCE-GOSSIP help a young student, by giving him some hints, as to collecting and mounting spiders; the best time, most likely localities, etc.? A few hints on mounting the smaller species for the microscope would also be acceptable. I am anxious to preserve the natural colours.—*Jas. Murray. Whitehaven.*

CAT AND PEACOCK.—Writing with reference to the sense of humour in animals, a correspondent tells an amusing story of a cat, The cat had conceived a great aversion for a peacock, which used to be fed on the lawn from the drawing-room windows, and found the following a pleasant method of expressing his feelings:—"When the peacock was anxious to display its charms, and had spread its tail, and was moving slowly backwards and forwards, the cat used to rush out on the lawn, and jump through the peacock's tail. The effect of this was to entirely disconcert the peacock's swagger, and leave the cat a moral victory."

CURIOUS FOOD OF THE HEDGEHOG.—Correspondents of a Newcastle paper state that all kinds of game fall occasionally victims to the hedgehog's appetite, and the partridge, the hare, and the pheasant seem to suffer equally from the voracity of this strange animal. M. Lenz announced in 1831 that one of the most interesting facts in the natural history of the hedgehog is that the most violent poisons have no effect upon them. This has since been confirmed by Professor Buckland and other physiologists. A German physician, who made the hedgehog a peculiar object of study, administered strong doses of prussic acid, of arsenic, of opium, of tobacco, of corrosive sublimate, none of which had any effect, or did Mr. Hedgehog any harm.

COCOA-NUT BUTTER.—This butter is now being made at Mannheim, and the demand for it is steadily increasing. The method of manufacture was discovered by Dr. Schlunk, a practical chemist. Liebig and Fresenius knew the value of cocoa-nut oil or fat, but did not succeed in producing it as a substitute for butter. The new butter is of a clear whitish colour, melts from 26° to 28° C., and contains 99·99 per cent. fat.

MITES IN THE NESTS OF ANTS.—Ants harbour a variety of other insects in their nests, particularly Gamaside mites, and Mr. A. D. Michael, from a study of ants in Corsica and at Innsbruck, has come to the conclusion that the ants willingly tolerate the presence of the Gamasids, and even protect them. The mites are found to ride away on the backs of the ants when the nest is disturbed; and sometimes the ants carry off the mites and their young just as they do their own. Mr. Michael thinks the mites repay the ants for their hospitality by removing the bodies of their dead, which they devour.

COLIAS EDUSA.—I was very glad to find, on opening the November number of SCIENCE-GOSSIP, that an entomologist had contributed some notes on the above butterfly. I may say that, so far as I have been able to judge, the male Clouded Yellow has, as Mr. Rees says, been much more abundant than the female. I was, however, able to secure more females than I actually wanted for my own cabinet, and so supplied several friends with spare female insects. I could have caught more, but having sufficient for my own and friends' requirements, I let the rest alone. Near Eastbourne, a Leicester entomologist informs me, that of a dozen or so specimens netted, almost all were females, which is quite contrary to the notes I have had from other places. I am sorry to find that Mr. Rees does not agree with either of my theories, as to the irregular appearance of Edusa. I must ask him to bear in mind that I only gave those theories for what they were worth, and that I did not pin my faith to either of them. In support of the second, I may venture to remark that many specimens of the butterfly were reported in the entomological journals early in the season; also that in 1877, I took several Edusæ so early in the year, that they could only have been hybernated specimens. These were all captured at Felixstowe, in which neighbourhood the butterfly was very common later

on, as indeed I believe it was everywhere. Regarding my first theory, if Mr. Rees' Edusæ had arrived during the sunny days that preceded "the four days of continuous rain and north winds," I do not see why they should have been spoilt by that bad weather. I took in one morning, when the wind was north-east, and squall after squall of heavy rain came up, three of my best Hyale, and many good clouded yellows. Of course they did not fly during the rain, but in the only two intervals of sunshine we had that day. For the three following days the weather was so bad that I did not go out, but the fourth day was warm and bright, and many specimens were on the wing, though only one or two that I saw were the worse for wear. Did all the Cardiganshire specimens hatch out on the morning that Mr. Rees saw them, or if not, why were they not spoilt by the bad weather? I did not net a single tattered fly till quite late in the month, though a few were somewhat rubbed. I regret that I was not in Suffolk at the time when hybernated insects might be looked for, so I cannot say if they were observed there this season. With regard to the theory advanced by Mr. Rees, it hardly seems to me more probable than my own. The food-plant is always abundant in Suffolk, and surely during the last fifteen years, the weather, winds, temperature, and parasites, cannot throughout that time, have been so adverse, that the fly did not appear in, at least, limited numbers. But during all those years, I have seen very few Edusæ indeed, though I have always been in Suffolk at the time when they should emerge from the chrysalis. Last year I did not observe a single clouded yellow at all in Suffolk. On the whole it seems to me that this vexed question is far from settled at present. I do not profess to be anything more than a mere elementary student of natural history, and I hope that some of those naturalists who have more time to devote to it than I have, will soon give us a really good explanation of the scarcity and abundance in different years of *Colias edusa.* In conclusion, I should be very glad to exchange some Suffolk clouded yellows for Cardiganshire specimens, as it would be interesting to note if there is any difference between them. If Mr. Rees would care to do this, I should be glad to hear from him about December 18th. Till then I shall be in a different part of the country, and shall not be able to get at my collection.—*L. Creaghe-Haward, Bramford, near Ipswich.*

IN answer to Mr. R. C. Chaytor's query in the November number of SCIENCE-GOSSIP, I beg to say that 52 feet 4 inches would be the length of a three-quarter-inch diameter pipe to hold exactly one gallon of water.—*W. H. May.*

THE SAME OLD PIPE.—In answer to the query on page 263 of last month's issue, as to what length of pipe ¾ in. diameter it would take to hold one gallon of water, I beg to say, if the pipe is quite true, and the other conditions exact, that it would take 52 feet 3¾ inches.—*Owen Carter.*

FRUIT AND BLOSSOM.—In your November number, on page 262, you refer to an apple-tree bearing fruit and blossom at the same time. A few weeks since I noticed a similar occurrence on an apple-tree in the garden of a house in Mount Ephraim Lane, Streatham. There was certainly fruit on the tree, though perhaps not much, and quite a number of bunches of blossom. The tree was very bare of leaves.—*W. I. Horn.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

TO ANONYMOUS QUERISTS.—We must adhere to our rule of not noticing queries which do not bear the writers' names.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply DISGUISED ADVERTISEMENTS, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges," which cannot be tolerated.

WE request that all exchanges may be signed with name (or initials) and full address at the end.

SPECIAL NOTE.—There is a tendency on the part of some exchangers to send more than one per month. We only allow this in the case of writers of papers.

TO OUR RECENT EXCHANGERS.—We are willing to be helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

"SCEPTICAL."—Consult Taylor's "Sagacity and Morality of Plants," chapter entitled "Turning the Tables," for full information on the point you seek. You have got hold of a half-truth.

F. ST. J. PARKER.—Your insects are a species of the suctorial Hemiptera (the Aphis, or green fly), and belong to the order of insects known as hemipterous, or half-winged. There are about 350 species of this order in England.

F. H. WEEKS.—The plant you enclosed last September got mislaid, hence the delay in replying to your query. It is the chervil (*Chærophyllum temulum*).

"ENTOMOLOGISTE."—By applying to the Secretary of the Entomological Society of London, at 11 Chandos Street, Cavendish Square, W., for all the rules and regulations necessary for election to the fellowship of the society.

A. C. WARD (Southampton).—Many thanks for the curious growth of a violet leaf from your garden. The stipulate, or flattened part of the leaf-stalk, is apparently unusually enlarged through the attacks of a fungus.

C. S. WATSON (Donegal).—Many thanks for your very kind offer of articles, but at present we have so many on hand that it is impossible to undertake the responsibility.

JAMES MURRAY (Whitehaven).—One of the best catalogues of plants on the flora of Cumberland, etc., is contained in the late Miss Martineau's "Guide to the English Lakes." Doubtless you will get the best and readiest information by applying to the Hon. Sec. of the Cumberland Association for the Advancement of Science, Keswick.

EXCHANGES.

MAGNIFICENT triple lantern by Steward, together with microscopic attachment, two aphengescopes, etc. Will take part exchange in electric apparatus, telescope, or working models of engines. For full particulars—Lyddm, West Park, Clifton, Bristol.

WANTED, SCIENCE-GOSSIP for 1873 and 1874.—T. A. Pearson, The Willows, Milnrow, near Rochdale.

WANTED, *Succinea oblonga, Acicula lineata, Helix cartusiana, Zonites excavatus, Bulimus obscurus, Helix terrestris.* Good exchange in British or foreign shells.—Mrs. Calphin, 1 Lauriston Park, Edinburgh.

AN Andrew Ross ⅛ objective, in perfect order. Will exchange for a ¼ Ross, Swift, or Powell and Leland. What offers? Address—Vicar, St. Stephen's, South Lambeth, S.W.

OFFERED, L. C., 8th ed., over a hundred duplicates, including 45, 76*c*, 121, 144, 163, 186, 254, 280, 283, 571, 621, 646, 691, 784, 807, 829, 1107, 1237, 1155*b*, 1215, 1414, 1434, 1577*b*, 1592, 1595, 1697, 1777. Lists exchanged. Wanted, rare British phanerogams and mosses.—Miss E. Armitage, Dadnor, Ross.

DUPLICATES.—*P. roseum, P. fontinale,* vars. *cinerea, pulchella,* and *henslowana, P. pusillum, P. nitidum.* Desiderata, *S. ovale* and *H. aspersa,* var. *exalbida.* None but specimens thoroughly cleaned and in good condition offered or wanted.—Charles Oldham, Ashton-on-Mersey.

ONE dozen good, large, and perfect carboniferous fossils given in exchange for one good specimen of any of the following varieties of silica: aventurine quartz, citrine, liver-opal, float stone, moss agate, prase, ribbon jasper, sardonyx.—P. J. Roberts, 11 Back Ash Street, Bacup.

MIOCENE plants from Œningen, in collections of 20 to 200 species, offered in exchange for fossil plants from other localities.—B. Schenk, Naturalist, Ramsen (Schaffhausen), Switzerland.

FORAMINIFEROUS sand (miocene) from New Zealand offered for other foraminiferous deposits.—R. Haeusler, Aarburg, Switzerland.

OFFERED, 175 birds' eggs, sixty-four species, including many rare species. Wanted, microscope, field-glass, or entomological specimens.—W. Roseburgh, 54 Market Street, Galashiels.

WANTED, micro. mounts of the different alcoholic ferments, or offers of unmounted material.—T. B., Conservative Club, Hinckley.

OFFERED, *Pecten similis.* Wanted, British marine shells not in collection.—James Simpson, 6 North St. Andrew Street, Aberdeen.

WANTED, a good coal section, also slides of *Distoma hepaticum.* Will give good exchange in other slides.—Geo. Parish, 124 Kingston Road, Oxford.

SPECTROSCOPE or micro. spectroscope wanted. Offered, "Carpenter on the Microscope" (1881), and large quantity of scientific and engineering books, with a Beck's Star Microscope.—Dr. Taylor, 26 Marchmont Street, London.

QUANTITY of lepidoptera, shells, and fossils, duplicates from own collection, to exchange for others, or for war medals and decorations, or masonic festival jewels.—Frederick Stanley, M.C.S., Margate.

I HAVE several nice pieces of coral (brainstone, branching, mushroom, red organ-pipe) to exchange for fossils.—Thomas W. Reader, 171 Hemingford Road, London, N.

DUPLICATES.—Rhamni, edusa, paphia, var. valezina, adippe, Atalanta, Sibylla, Galathea, Semele, Adonis, Corydon, Jacobæa, hirtaria, perla, etc.; also foreign butterflies. Desiderata, other lepidoptera or offers.—A. H. Shepherd, 81 Corinne Road, Tufnell Park, London.

WANTED, entomological apparatus and microscopical accessories in exchange for insects, reptiles, or microscopic animals from here.—F. W. Urich, Trinidad, B.W.I.

Acme lineata, var. *alba*, *Vertigo antivertigo*, *V. substriata*, *V. alpestris*, *V. pygmæa*, *V. pusilla*, *V. angustior*, *Pupa ringens*, *Helix pygmæa*, and other rare shells offered in exchange for *Limnæa involuta*, *Succinea oblonga*, and *Helix obvoluta.*—A. Hartley, 14 Croft Street, Idle, near Bradford, Yorkshire.

OFFERED, rare birds' eggs, corals, case of sponges and gorgonias, and two charts of fossils. Desiderata, eggs, books, good modern atlas, or aneroid barometer.—Jas. Ellison, Stecton, Keighley.

WANTED, Cambrian, gault, and Jurassic fossils, also magic-lantern slides. Offered, Cornish rocks and minerals.—W. Holver, British Schools, Truro.

WANTED, named and localised specimens of fossils from the Cambrian, Devonian, and Old Red Sandstone, carboniferous, permian, triassic, jurassic (oolites and lias); also the rarer minerals, and latest edition of Lyell's "Principles of Geology," and British Coleoptera.—Dr. J. Beecham Mayor, Heaton Chapel, Manchester.

WANTED, Cox's "Handbook of British Coleoptera." Exchange glass-topped and store-boxes, etc.—C. Coles, 61 Barrington Road, Brixton, S.W.

DUPLICATES for exchange, L. C., 8th ed.:—41, 97, 116, 120, 155, 273, 369, 383, 394, 395, 402, 633, 652, 824, 836*b*, 876, 885, 898, 965, 1034, 1061, 1075, 1100, 1134, 1147, 1156, 1197, 1201, 1238, 1240, 1383, 1547, 1563, 1571, 1572. 1610, 1628, 1629, 1643, 1645, 1654, 1660, 1661, 1662, 1675, 1685, 1699, 1737. Desiderata many, especially local Scotch and Irish.—A. H. Wolley Dod, 31 Nightingale Place, Woolwich.

LEPIDOPTERA.—Lutosa, phragmitidis, gothica, petisitis, gemina, thalacina, and bacilina, and a few others, all good and perfect, in exchange for other moths or butterflies.—F. Womersley, 22 Bewsey Road, Warrington.

SCIENCE-GOSSIP for 1883–84 wanted, bound or unbound.—Mr. S. S. Platt, C.E., King Street South, Rochdale.

OFFERED, "Insect Variety," "Knowledge" for 1890 (publisher's binding), also for 1891 and 1892, unbound. Wanted, Goebel's "Botany," Newman's "Moths," Saunders' "British Birds," or works on chemistry or botany of recent date.—G. A. Mitchell, 109 Forth Street, Glasgow.

WANTED, lists of desiderata and duplicate specimens in British mosses, for the purpose of mutual exchange.—E. J. Elliott, Middle Street, Stroud, Glos.

DUPLICATES.—*S. populi*, *dispar*, *Jacobæa*, *caja* (large), *Chi. menthrasta*, *P. vaurium*, *L. manacha*, *P. gamma*, *A. Cynthia*, *adippe*, *Atalanta*, *cardui*, *janira*, *phlacas*, *icarus*, and a lot of others, for shells, insects, etc., not in collection.—W. Turnbull, 1 Horne Terrace, Edinburgh.

WANTED, fronds of common ferns, and common land and freshwater shells in quantities. Insects, etc., in exchange.—S. L. Mosley, Beaumont Park, Huddersfield.

A FOUR-DRAWER egg-cabinet, containing a small collection of English gulls' and wild birds' eggs, in exchange for foreign coins or stamps.—Dr. Waters, 21 Westbourne Park Road, Bayswater, London.

BEETLES.—Will exchange Australian queen beetles for *Aromia moschata*, *Cetonia aurata*, *Trichius fasciatus*, *Lucanus cervas*, *Cicindela campestris*, *Typhæus vulgaris*, or others.—John M. Whitehead, Albert Place, Galashiels, N.B.

WHAT offers for a number of guides and text-books for the London Matric. Exam., also several books on photography?—Parritt, 8 Whitehall Park, Hornsey Rise, N.

WHAT offers in exchange for twenty years' SCIENCE-GOSSIP, all complete, many bound in half-calf, all clean?—A. Draper, Cemetery Road, Sheffield.

OFFERED, three Looloo Islanders' grass dresses. Would take history or science books in exchange.—Arthur J. Marks. 17 Gresley Road, Hornsey Lane, N.

WANTED, good botanical, geological, and other microscopic slides; also wanted, rare British shells and silver coins (old issues). Return made in shells, rare unmounted microscopic objects, etc.—T. E. Sclater, Natural History Stores, Teignmouth.

TOKENS of the following places wanted: Newcastle-on-Tyne, Durham, Darlington, S. Shields, Stockton, Bewick Main Colly, and others issued from North of England. Also rare birds' eggs, foreign land and marine shells, and corals. Can offer in exchange foreign stamps and coins.—J. S. Wood, Walker Gate, Northumberland.

OFFERED, Sowerby's "Conchological Manual" (4th edition, 29 plates), and Wood's "Field Naturalists' Handbook." Wanted, good works on conchology, or rare foreign shells not in collection.—J. E. Cooper, 93 Southwood Lane, Highgate, London, N.

WANTED, the two volumes of Claus and Sidgwick's "Zoology" (English). Can offer in exchange a large series of first-class marine microscopical slides.—S. C., Post Office, Lower Tottenham.

CASSELL'S "Cathedrals, Abbeys, and Churches of England and Wales," complete in thirty 7*d.* parts; quite new. What offers in foreign shells?—F. C. Long, 32 Woodbine Road, Burnley, Lancs.

MR. LOUIS GIRAUX, 22 Rue Saint Blaise, Paris, offers several hundreds of species of fossils, well named, of Parisian tertiary beds, presented by very fine samples. He will accept in exchange fossils, shells, and postage stamps. Forward lists of exchange. French and English correspondence.

BOOKS, ETC., RECEIVED FOR NOTICE.

"The Victorian Naturalist."—"British Fungus-Flora."—"The Electric Light."—"The Entomologists' Record" (London: Elliot Stock).—"Population and Social Reform," by Harry Roberts (London: R. Forder, 28 Stonecutter Street).—"The Beauties of Nature," by the Right Hon. Sir John Lubbock, Bart., M.P. (London: Macmillan & Co.).—"The American Monthly Microscopical Journal" (Chas. W. Smiley, publisher, Washington).—"The Microscope" (The Microscopical Publishing Co.).—"Journal of the Royal Microscopical Society" (London and Edinburgh: Williams & Norgate).—"Castorologia," by Horace T. Martin, F.Z.S., etc. (London: Edward Stanford).—"The Botanical Gazette" (Bloomington, Indiana).—"The Gentleman's Magazine" (London: Chatto & Windus).—"The Great World's Farm," by Selina Gaye (London: Seeley & Co.).—"Natural Science."—"Feuille des Jeunes Naturalistes" (November number).—"The Naturalist" (London: Reeve & Co.).—"The Entomologist" (London: West, Newman & Co.).—"The Midland Naturalist" (London: Simpkin & Marshall).—"Trinidad Field Naturalists' Club" (October number).—"Nature Notes" (London: H. Sotheran & Co.).—Geological Magazine" (London: Kegan Paul, Trench, Trübner & Co.).—Strange Survivals," by S. Baring Gould, M.A. (London: Methuen & Co.)—"Catalogue of Eastern and Australian Lepidoptera Heterocera," by Colonel C. Swinhoe, F.L.S., F.Z.S., etc. (Oxford: Clarendon Press).—"Finger Prints," by F. Galton, F.R.S. etc. (London: Macmillan & Co.).—"British New Guinea," by J. P. Thomson.—"The History of Creation," from the German of Ernest Hæckel, translated by E. Ray Lankester, M.A., LL.D., etc. (London: Kegan Paul, Trench, Trübner & Co.).—"Ancient History from the Monuments—Sinai," by the late Henry Spencer Palmer (Society for Promoting Christian Knowledge), etc., etc.

COMMUNICATIONS RECEIVED UP TO THE 11TH ULT. FROM: C. A. D.—H. N. H.—J. E. N.—J. T. D.—J. S.—H. P.—A. H. S.—G. D.—H. D.—Mrs. C.—J. H. H.—F. S. J. P.—C. P.—L. C. K.—F. M. H.—E. A.—F. S. L.—C. B. M.—T. A. P.—A. Y. M. M.—C. S. W.—T. H. B.—O. A. S.—J. M. W.—W. H. M.—J. T.—G. W.—F. W. N.—W. I. S.—P. T.—P. S. S.—W. A. B.—R. H. M.—H. W. P.—T. E. S.—D. W. B.—S. L. M.—J. M.—F. W.—S. C.—T. W. R.—A. H.—A. H. S.—F. S.—J. R. H.—Dr. T.—G. P.—J. S.—A. J. A.—A. A.—A. H. W. D.—S. G.—C. C.—W. H.—D. F. B.—A. D.—J. E.—J. W. D. K.—W. A. P.—S. S. P.—A. V. M.—G. A. M.—H. E. C.—W. T.—E. J. E.—J. S. W.—A. J. M.—J. S.—M. D. H. A.—P. J. R.—W. R.—T. B.—C. O.—A. C. W.—F. T.—C. C. D.—E. A. M.—L. G.—F. C. L.—J. E. C.—H. E. G.—I. E. P.—R. A. C.—D. T.—T. W. S.—A. S.—T. S. E.—R. T.—M. W. W.—Dr. S. E. J.—etc., etc.

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